9.00. Intro to Psychology

Professor John Gabrieli

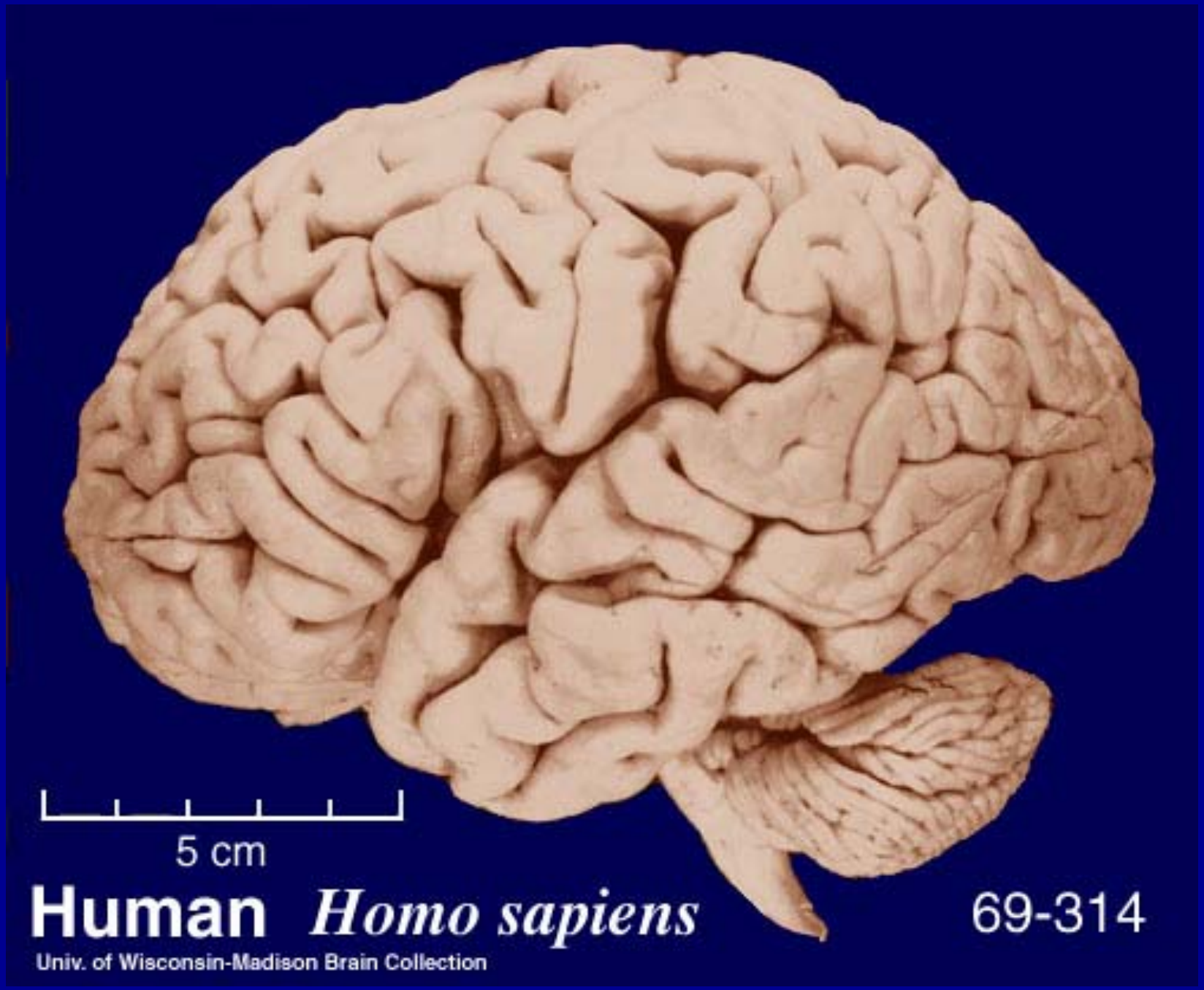
9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

9.00. Intro to Psychology

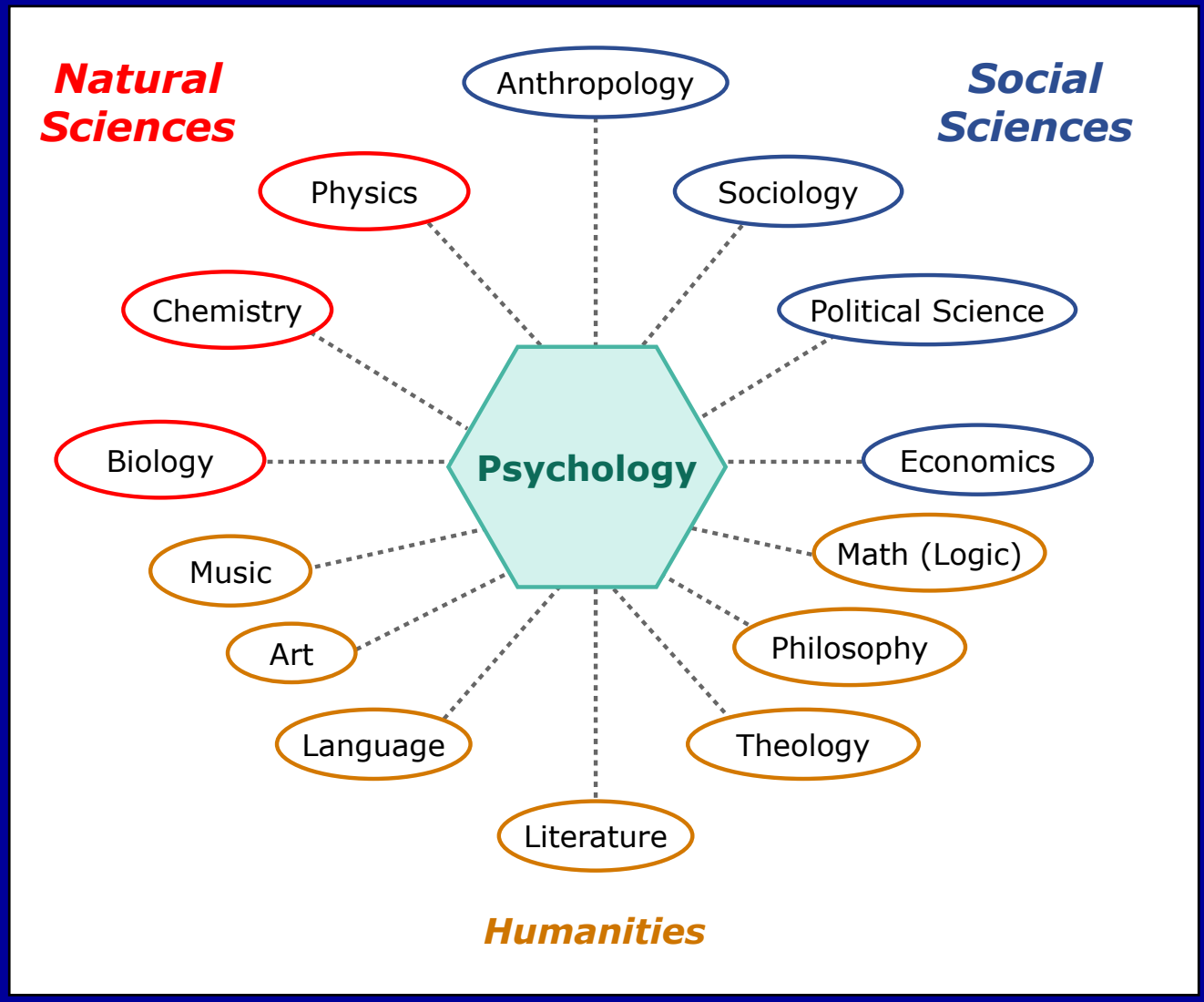
***Objective*: Scientific study of human nature/mind/behavior**

- **brain**
- **perception**
- **cognition**
- **emotion**
- **personality**
- **development**
- **social interaction**
- **psychopathology**



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and http://brainmuseum.org, supported by the US National Science Foundation.

A Psychocentric View



After Peter Gray, "The Value of Psychology 101 in Liberal Arts Education: A Psychocentric Theory of the University." *Observer* (APS), October 2008.

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

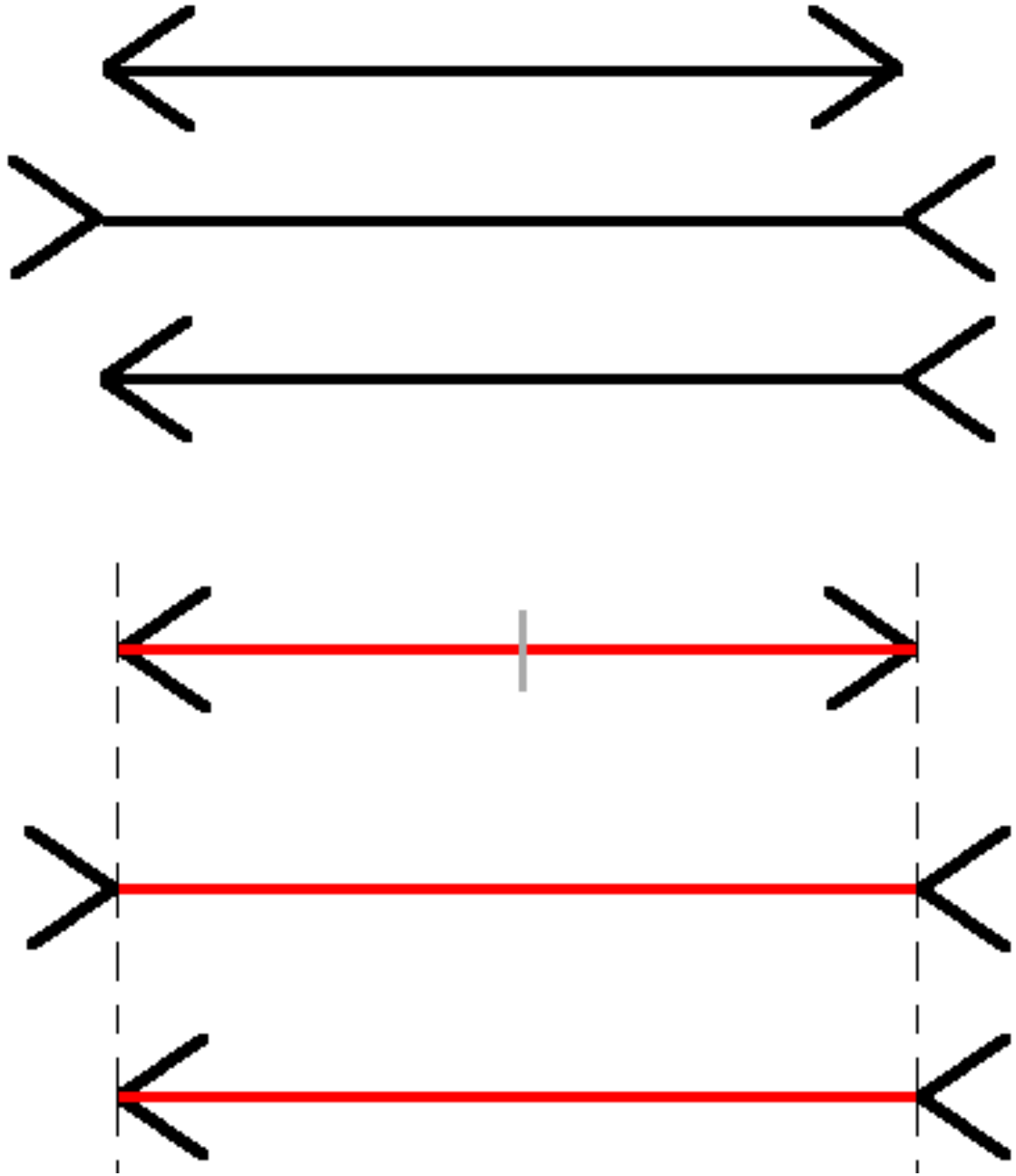
how our minds make our worlds

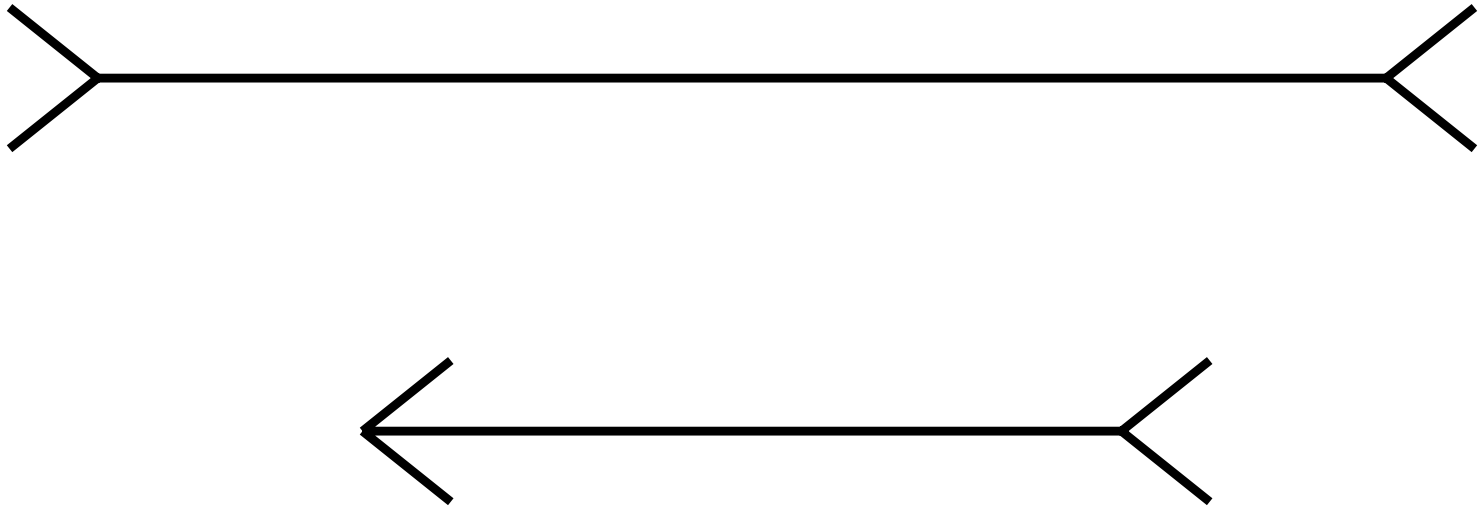
9.00. Intro to Psychology

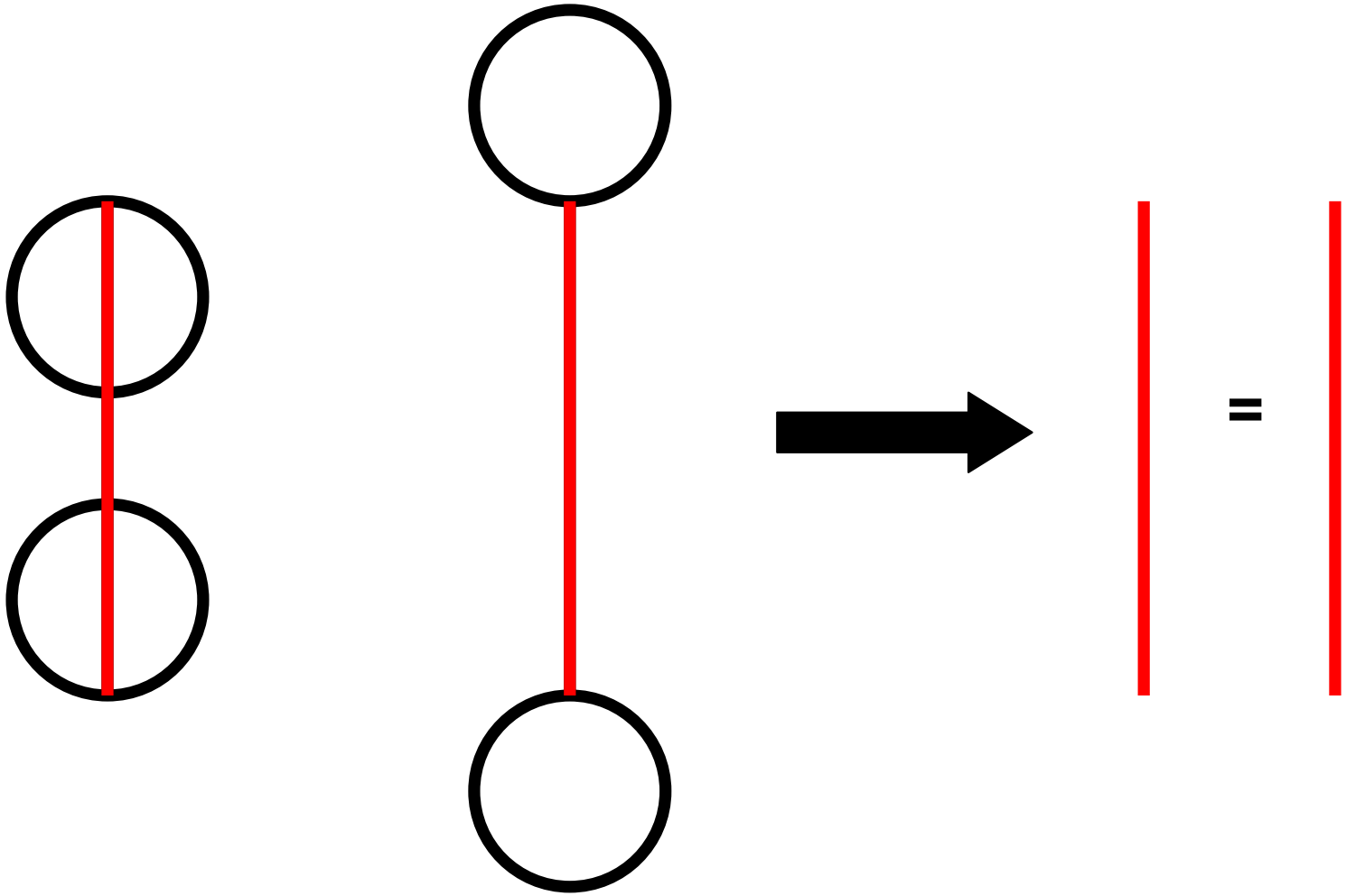
***Objective*: Scientific study of human nature/mind/behavior**

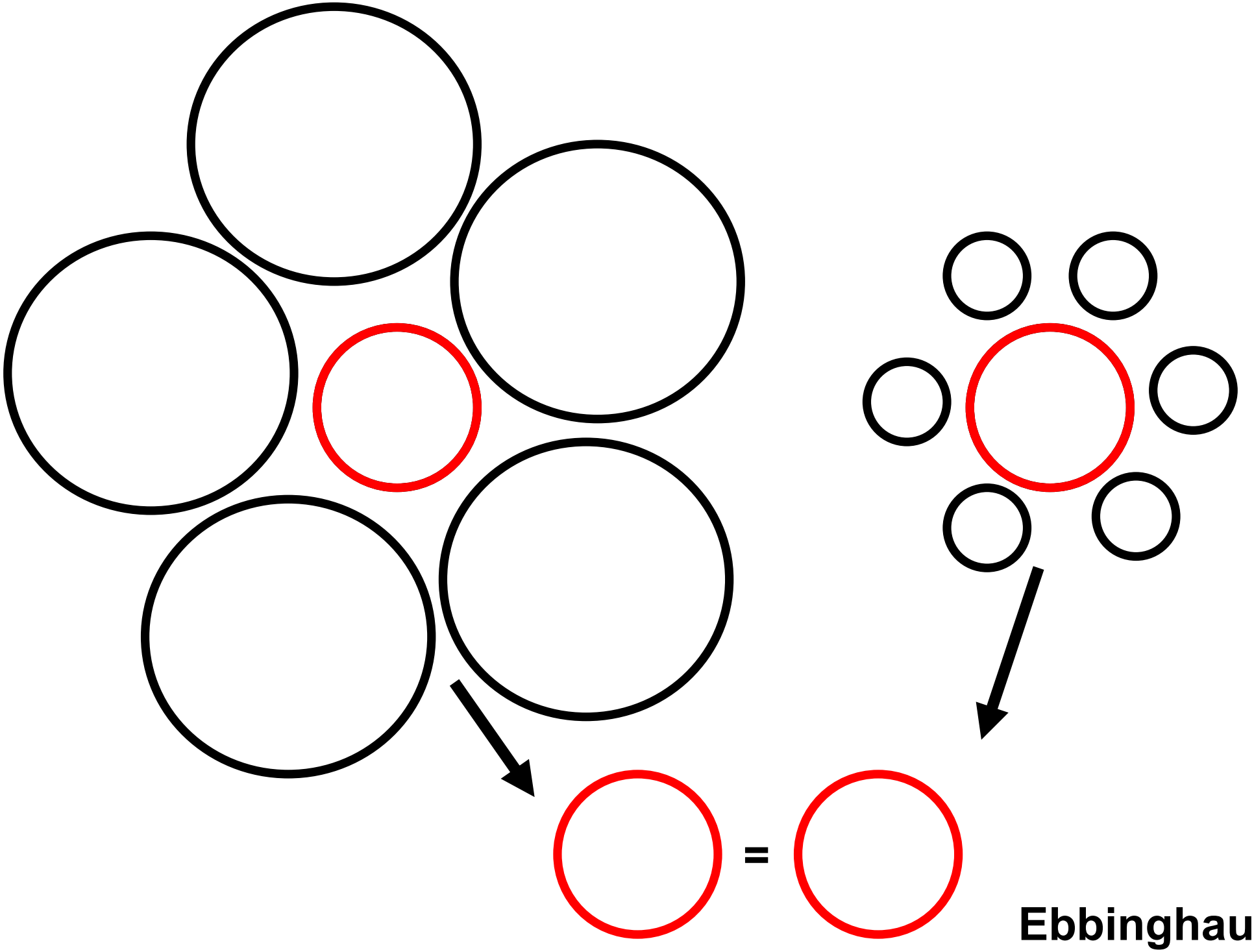
how our minds make our worlds

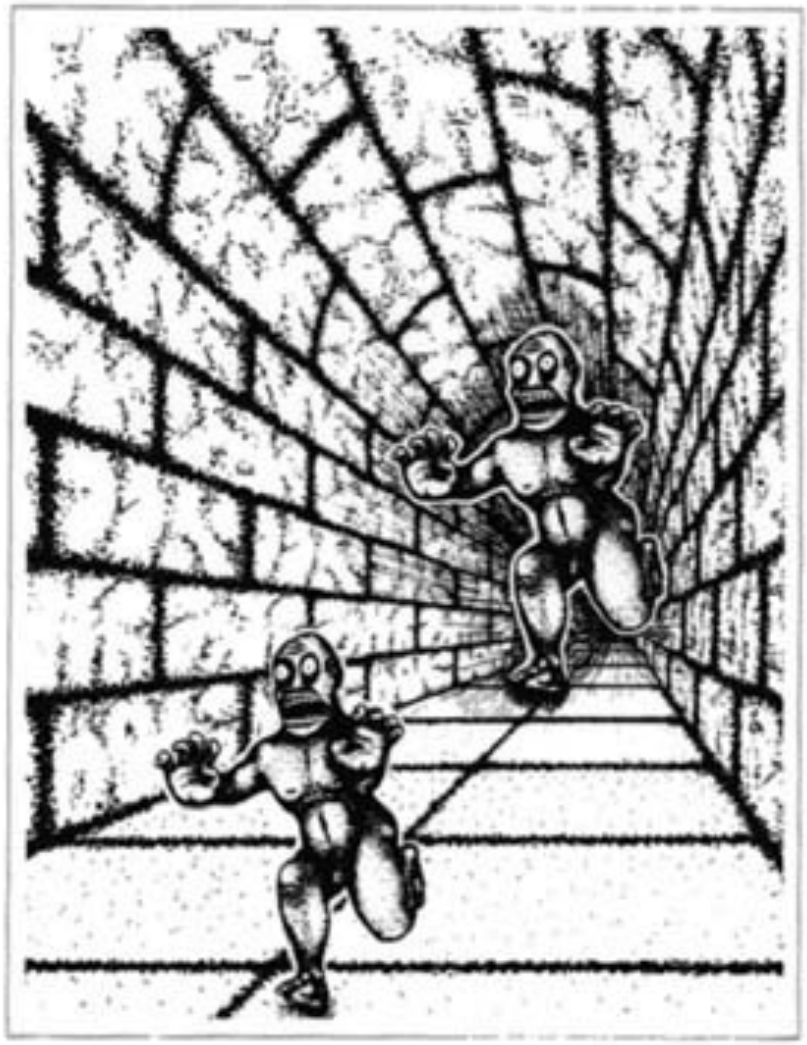
what we *see*

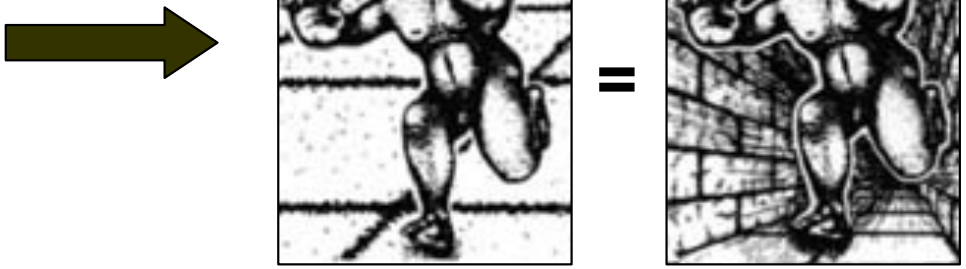






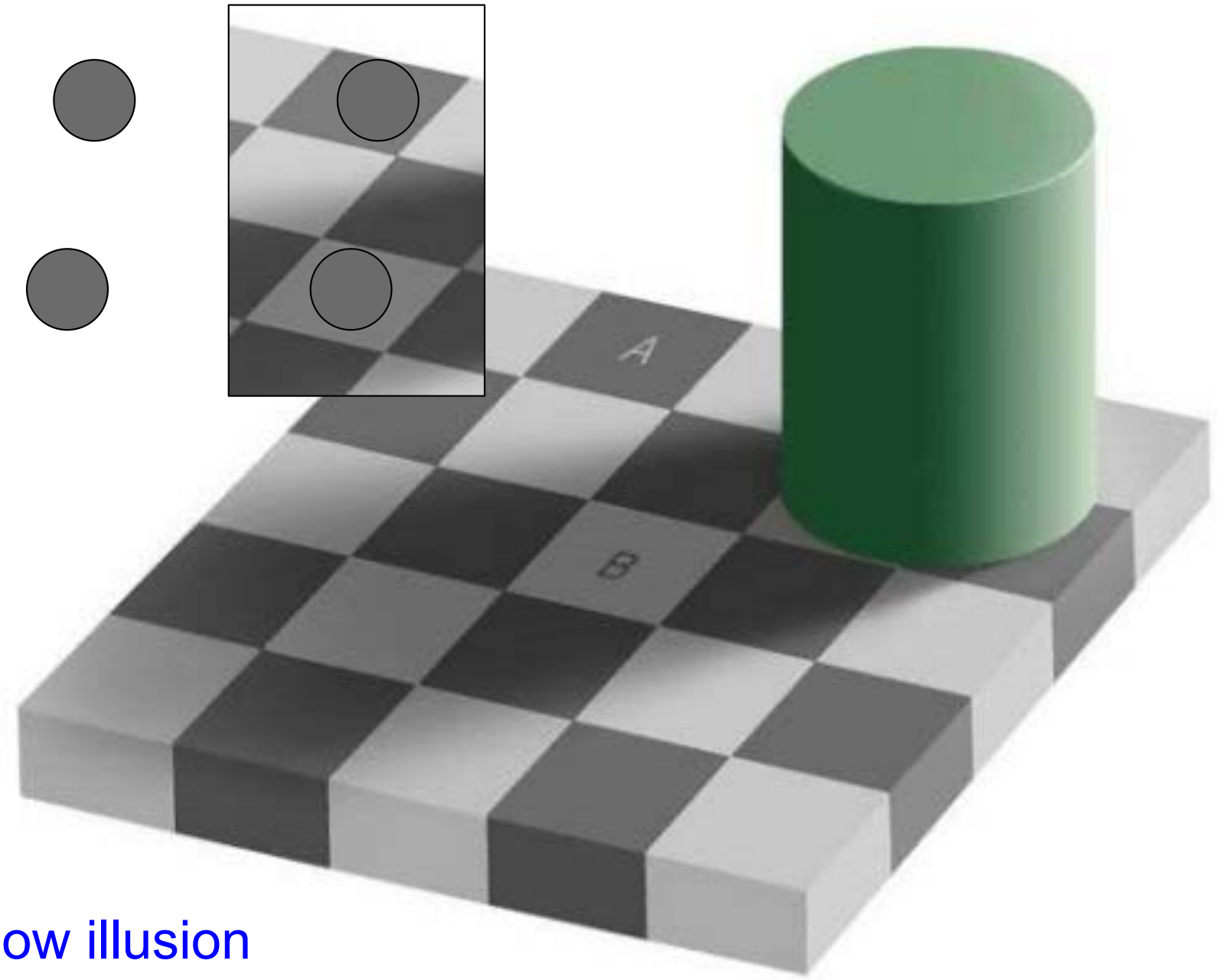

=
Ebbinghaus





Source: Shepard, R. *Mind Sights: Original Visual Illusions, Ambiguities, and Other Anomalies, With a Commentary on the Play of Mind in Perception and Art*. W H Freeman & Co, 1990. © W H Freeman & Co. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Checker-shadow illusion



Checker-shadow illusion

Courtesy of Professor Edward H. Adelson. Used with permission.

Visual/Optical Illusions

Criss-Cross Effect

The Koffka Ring

White's Illusion

Simultaneous Contrast Effect

From "Lightness Perception and Lightness Illusions." MIT Perceptual Science Group.

Illusions cont'd

Shepard's Tables

Stepping Feet

Shading, Depth, and Faces

Memory for a Picture

10 questions

Memory for a Picture

Group A:

You are going to look briefly at a picture and then answer some questions about it. The picture is a rough sketch of a poster for a trained seal act. Do not dwell on the picture. Look at it only long enough to "take it all in" once. After that, you will answer *yes* or *no* to a series of questions.

Memory for a Picture

Group B:

You are going to look briefly at a picture and then answer some questions about it. The picture is a rough sketch of a poster for a costume ball. Do not dwell on the picture. Look at it only long enough to "take it all in" once. After that, you will answer *yes* or *no* to a series of questions.



Source: Weiten, Wayne. *Psychology: Themes and Variations*. Cengage Learning, 2010. © Cengage Learning. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

In the picture was there:

		YES	NO
1.	An automobile?	____	____
2.	A man?	____	____
3.	A woman?	____	____
4.	A child?	____	____
5.	An animal?	____	____
6.	A whip?	____	____
7.	A sword?	____	____
8.	A man's hat?	____	____
9.	A ball?	____	____
10.	A fish?	____	____

Memory for a Picture

Group A:

You are going to look briefly at a picture and then answer some questions about it. The picture is a rough sketch of a poster for a *trained seal act*. Do not dwell on the picture. Look at it only long enough to "take it all in" once. After that, you will answer *yes* or *no* to a series of questions.

Group B:

You are going to look briefly at a picture and then answer some questions about it. The picture is a rough sketch of a poster for a *costume ball*. Do not dwell on the picture. Look at it only long enough to "take it all in" once. After that, you will answer *yes* or *no* to a series of questions.

13

13

A TEST OF ATTENTION & COUNTING!

HOW MANY TIMES DO THE PEOPLE IN THE WHITE SHIRTS PASS THE BASKETBALL?

A TEST OF ATTENTION & COUNTING!

Watch video at
http://www.youtube.com/watch?v=vJG698U2Mvo

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

how our minds make our worlds

what we *hear*

What is he saying?

McGurk Effect Demo

http://www.youtube.com/watch?v=aFPtc8BVdJk

What is he saying?

McGurk Effect Demo

- Most adults (98%) think they hear "**DA**"
- In reality, you
 - *hear* the sound "**BA**"
 - *see* the lip movements "**GA**"

H. McGurk & J. MacDonald, Nature, 1976

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

how our minds make our worlds

what we *know*

Which is farther east: San Diego or Reno?

Which is farther north: Philadelphia or Rome, Italy?

Which is farther north: Atlanta or Chicago?

Which is farther north: Portland or Toronto?

Which is further west:
Miami, Florida or Santiago, Chile?

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

how our minds make our worlds

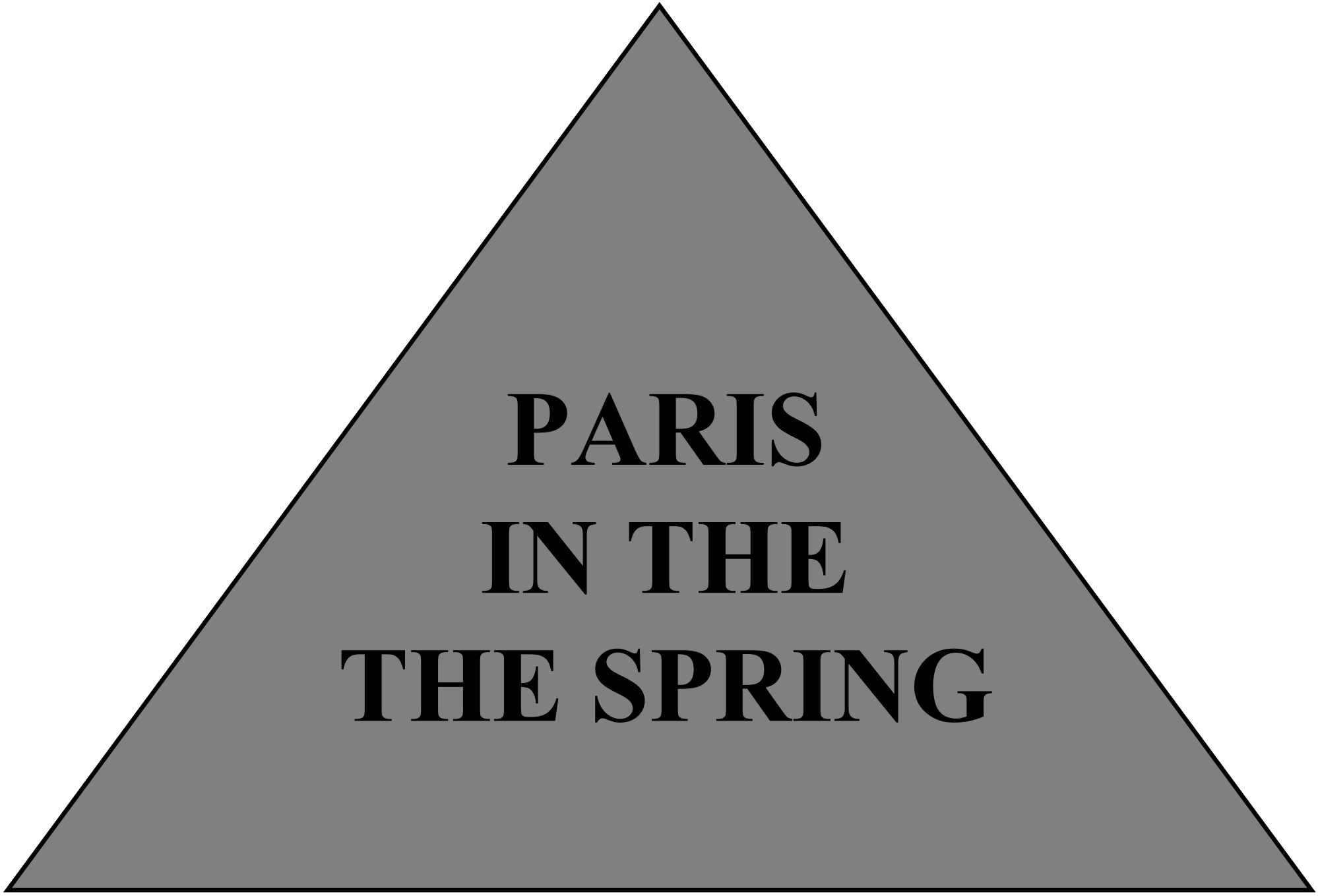
what we learn and remember

LISTEN TO THE WORDS,
THEN WRITE DOWN THE WORDS
YOU REMEMBER

Automaticity

- Power
- Peril

ONE WAY
NOT DO
ENTER


PARIS
IN THE
THE SPRING

HOW MANY F’s?

FINISHED FILES ARE THE RE-
SULT OF YEARS OF SCIENTIF-
IC STUDY COMBINED WITH
THE
EXPERIENCE OF MANY YEARS

Stroop Effect

Word Set #1

RED	GREEN	BLUE	YELLOW	PINK
ORANGE	BLUE	GREEN	BLUE	WHITE
GREEN	YELLOW	ORANGE	BLUE	WHITE
BROWN	RED	BLUE	YELLOW	GREEN
PINK	YELLOW	GREEN	BLUE	RED

Word Set #2

RED	GREEN	BLUE	YELLOW	PINK
ORANGE	BLUE	GREEN	BLUE	WHITE
GREEN	YELLOW	ORANGE	BLUE	WHITE
BROWN	RED	BLUE	YELLOW	GREEN
PINK	YELLOW	GREEN	BLUE	RED

There are 30 people in a group. You get the month and date of each person's birthday. What is the approximate probability that two of the people will have the exact same birthday?

a) 90%
b) 70%
c) 50%
d) 30%
e) 10%

COGNITIVE & AFFECTIVE FORECASTING

- think about your future

AFFECTIVE FORECASTING

- **think about your future**

most people think about achieving & succeeding rather than fumbling or failing

AFFECTIVE FORECASTING

- **if I don't get tenure, I will be sad… if I do get tenure I will be happy**

 two years later - no difference

- **if I win the lottery, I will be happy!**

 a year or two later, no difference

AFFECTIVE FORECASTING

- **if I don't get tenure, I will be sad… if I do get tenure I will be happy**

 two years later - no difference

- **if I win the lottery, I will be happy!**

 a year or two later, no difference

- **accident leading to quadriplegia or paraplegia - return to typical ratings in 3 months**

Mispredicting Affective and Behavioral Response to Racism - Kawakami et al., Science, 2009

- Racism is condemned
- Blatant racism still occurs
 - 33% of whites report hearing anti-black slurs in workplace

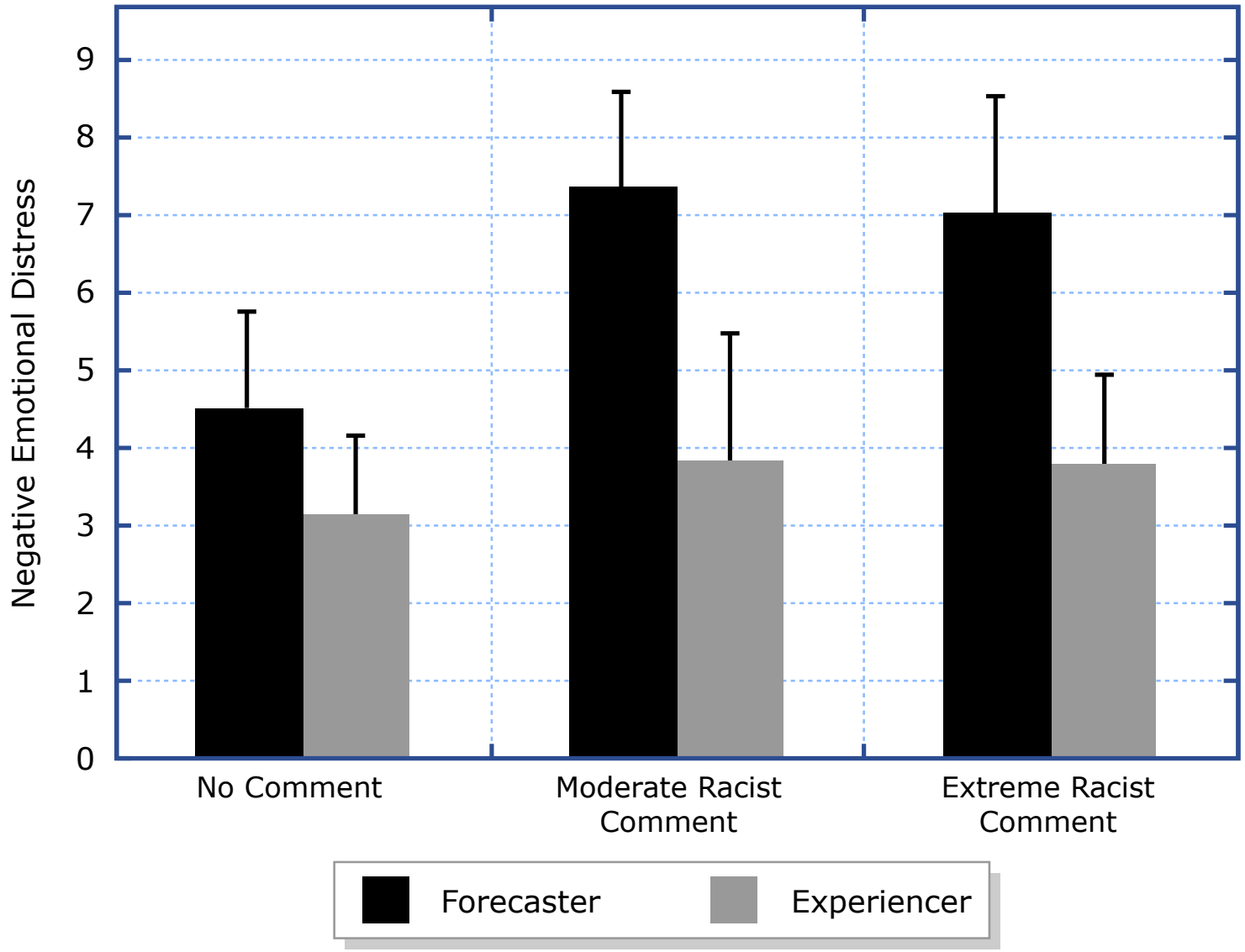
Mispredicting Affective and Behavioral Response to Racism

- two groups - “forecaster” or “experiencer”
- you enter room - see a black male & a white male - black male leaves room to get cell phone, gently bumps white male knee
 - •• control - nothing else
 - •• moderate slur “Typical, I hate it when black people do that”
 - •• extreme slur …. “clumsy N word”

Mispredicting Affective and Behavioral Response to Racism

- two groups - “forecaster” or “experiencer”
 - •• control - nothing else
 - •• moderate slur “Typical, I hate it when black people do that”
 - •• extreme slur …. “clumsy N word”
- black male returns, experimenter gives survey on current feelings, asks you to pick a partner for anagram task

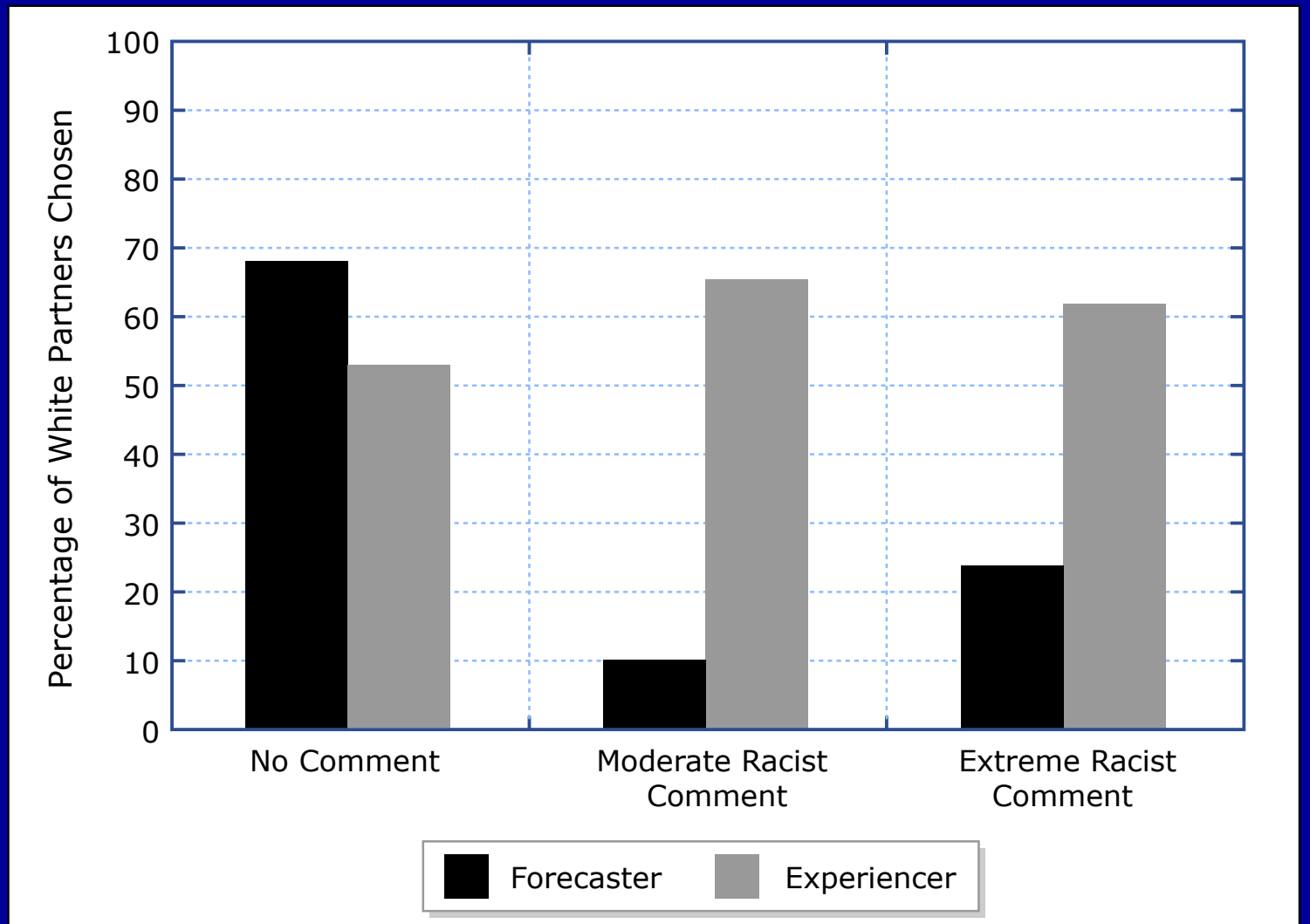
A Gap Between Attitudes & Actions



See Kawakami, K., et al. "Mispredicting Affective and Behavioral Responses to Racism." *Science* 323, no. 5911 (2009): 276-8

Image by MIT OpenCourseWare.

A Gap Between Attitudes & Actions



See Kawakami, K., et al. "Mispredicting Affective and Behavioral Responses to Racism." *Science* 323, no. 5911 (2009): 276-8.

Image by MIT OpenCourseWare.

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

how our minds make our worlds

- **what we *see* & *hear***
- **what we *remember***
- **what we *know***
- **how we *think***
- **how we *feel***
- **how we *act***

MIT OpenCourseWare
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9.00SC Introduction to Psychology
Fall 2011

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9.00 Research Methods
Lecture 2

Prof. John Gabrieli

“Almost half of children of divorces enter adulthood as worried, under-achieving, self-deprecating, and sometimes angry young men and women”

Time, “The Lasting Wounds of Divorce”

Psychologist Judith Wallerstein, quoted in Toufexis, A., and G. Harbison. "The Lasting Wounds of Divorce." *Time*, Februray 6, 1989. © Time Inc. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Psychology & Science

- what is science
- what is an experiment
- very brief history of psychology experimentation
- some issue in experimentation
- some psychological topics

HOW DO YOU KNOW WHAT IS TRUE?

AUTHORITY (faith)

REPETITION (tenacity)

A PRIORI (reasonable)

SCIENTIFIC ANALYSIS

WHAT MAKES SOMETHING SCIENCE?

Scientific community says it is scientific

WHAT MAKES SOMETHING SCIENCE?

SCIENTIFIC METHOD

- Falsifiable
- Probabilities
- Explanatory

- Description
- Correlation
- Experimentation

- Null hypothesis
 you disprove ideas, not prove ideas
- Filter model
 frontier vs. textbook

Three cartoons removed due to copyright restrictions.
1.Nick Downes. “He’s consistently right in proving his experiments wrong”
2.Nick Downes. Teacher writing the steps of The Scientific Method on chalkboard for his students; step 5 is “Have a beer”
3.Wiley Miller / Non-Sequitur. “The Truth and the Rebuttal.” Dec. 4, 2001. http://www.gocomics.com/nonsequitur/2001/12/04

WHAT MAKES SOMETHING AN EXPERIMENT?

dependent variable

what you measure - the outcome

independent variable

what you vary

Wilhelm Wundt (1832-1920)

-University of Leipzig

-First textbook in psychology

-First university-based laboratory in psychology

-*Mental chronometry*

Press key to light	(0.20 sec)
Press one key if red, Other key if green	(0.29 sec)
Time to judge color	(0.09 sec)

Edward Titchener (1867-1927)

-English/Oxford

-Ph.D. at Leipzig with Wundt

-New department of psychology at Cornell

-*Introspection* - look inward objectivity

-Private vs. public technique

John B. Watson (1978-1958)

- -University of Chicago/Johns Hopkins
- -"Mind" unobservable
- -*Behaviorism*
 - Study behavior = observable actions, not the mind
- -Identifying environmental conditions
- -No fundamental difference between animals and humans
- -Describe lawful relations between environment-behavior reflexes

STIMULI ---------- RESPONSES
(environment) (behavior)

Cognitive Revolution

- **Mental (and later neural) representations of stimuli and responses**

STIMULI → MIND / BRAIN → Responses

Correlation vs. Causation

- only an experiment (independent variable) can define causation

Age of Parent & Risk for Disease in Child

DOES AGE OF MOTHER INCREASE LIKLIHOOD OF DISEASE IN CHILDREN?

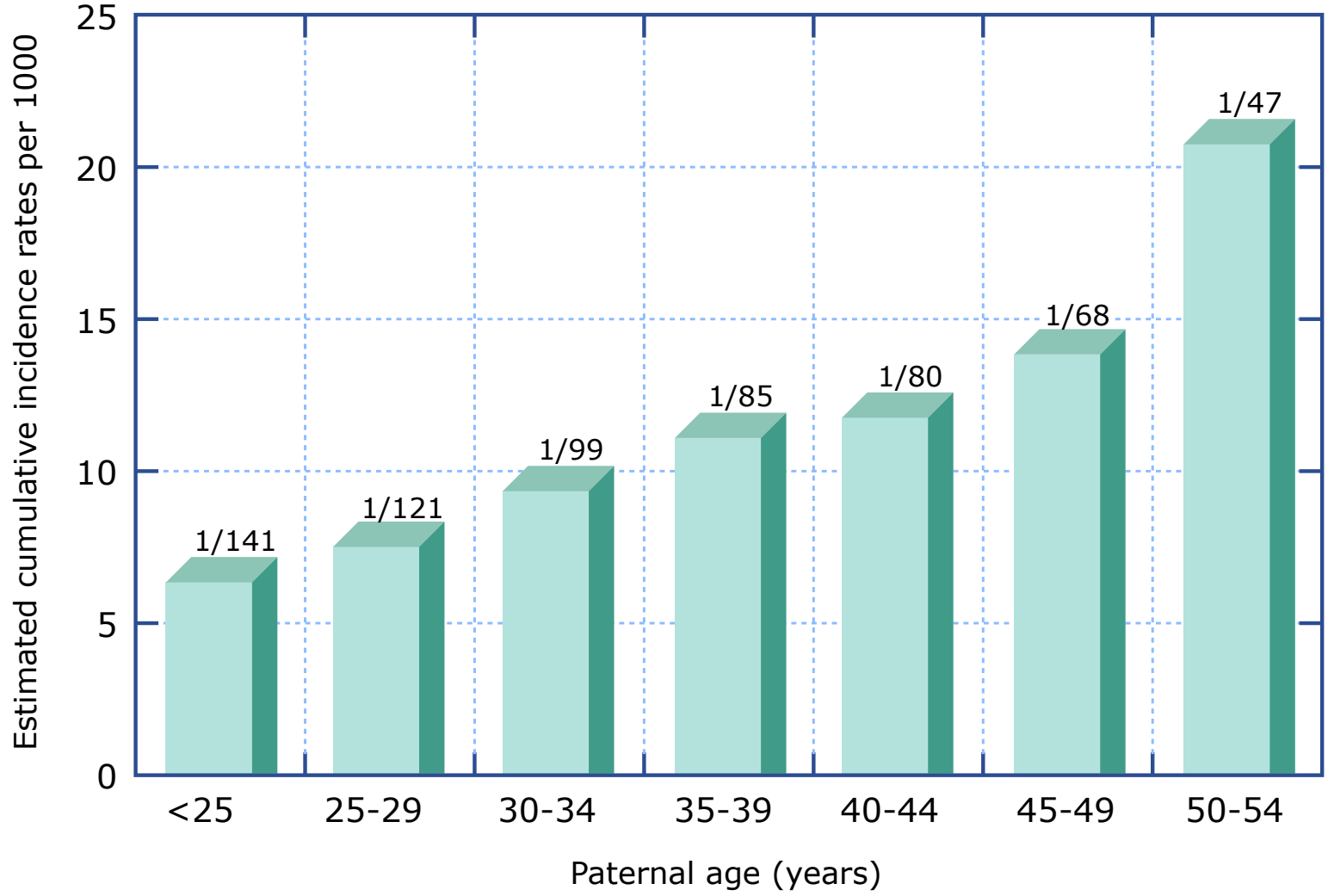
Down's Syndrome

Mother ages 20-24 - 1/1562

over 42 - 1/19

DOES AGE OF FATHER INCREASE LIKLIHOOD OF DISEASE IN CHILDREN?

Estimated cumulative incidence and percentage of offspring estimated to have an onset of schizophrenia by age 34 years, for categories of paternal age



Data from Malaspina, D., et al. "Advancing Paternal Age and the Risk of Schizophrenia."*Arch Gen Psychiatry* 58, no. 4 (2001): 361-7.

Image by MIT OpenCourseWare.

DOES AGE OF FATHER INCREASE LIKLIHOOD OF DISEASE IN CHILDREN?

aging sperm?

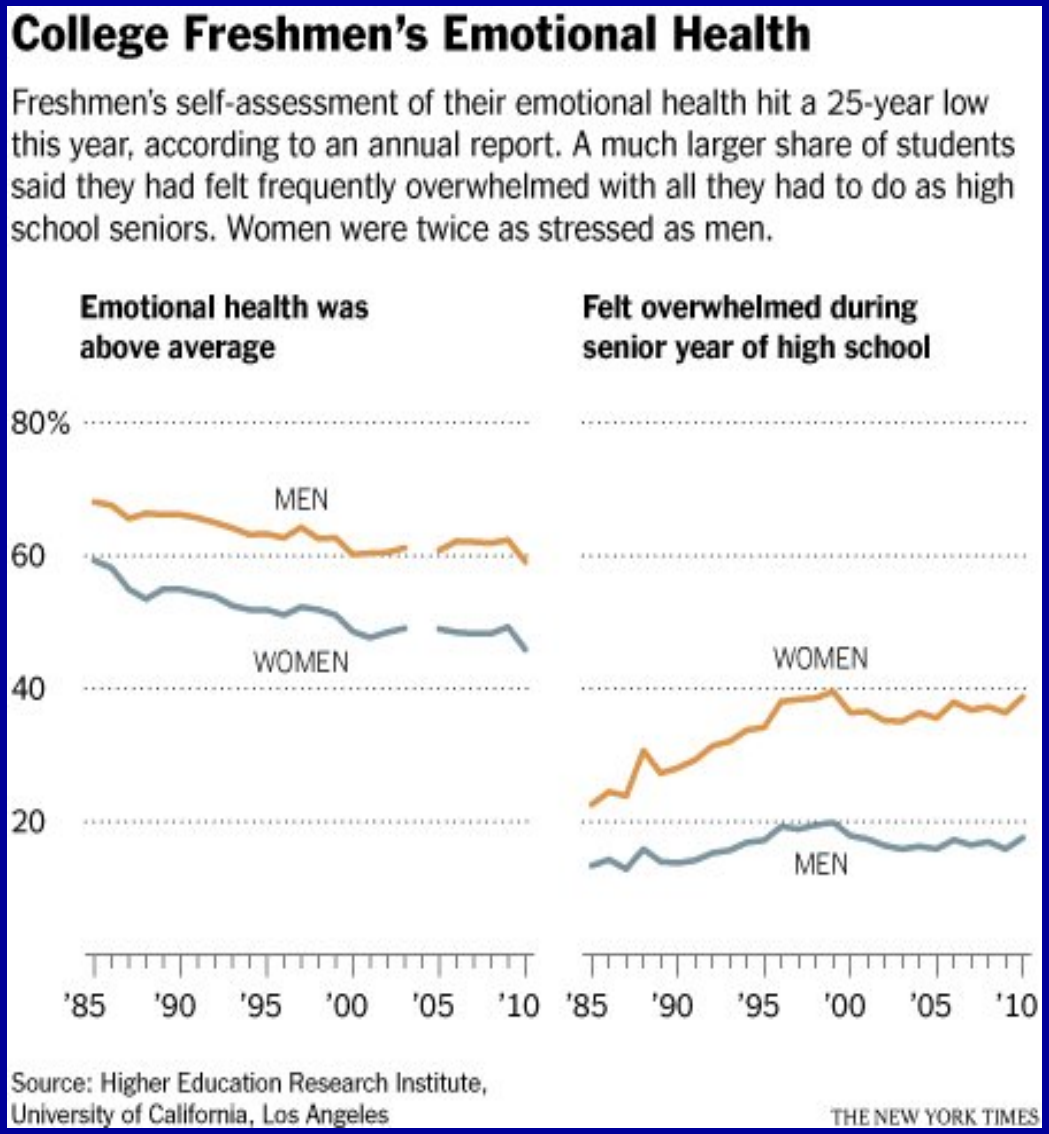
DOES AGE OF FATHER INCREASE LIKLIHOOD OF DISEASE IN CHILDREN?

aging sperm?

or who marries later in life?

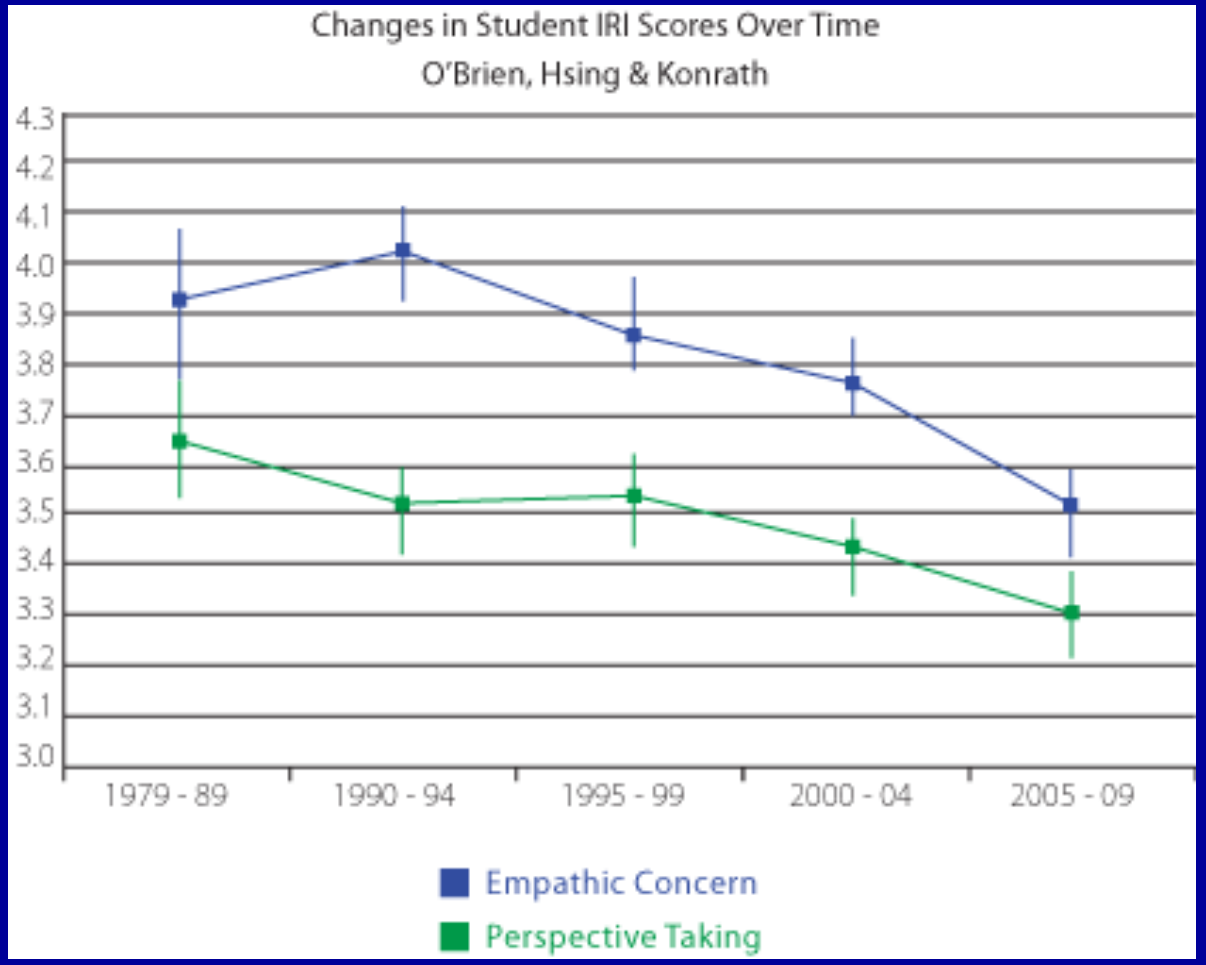
Your Level of Stress & Empathy Relative to Prior Years of College Students?

Your Level of Stress



From Lewin, T. "Record Level of Stress Found in College Freshmen." *The New York Times*, January 26, 2011. © The New York Times Company. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Your Level of Empathy



Graph provided by Education-Portal.com and original data modeled after "Changes in Dispositional Empathy Over Time in American College Students" by Sara Konrath, University of Michigan.

40% lower today than 20 years ago

The “broken window” theory

Political scientist James Wilson & criminologist George Kelling

Photo removed due to copyright restrictions.
New York City mayor Rudy Giuliani swearing in new NYPD Commissioner Bill Bratton (1994).



Photo courtesy of Grant MacDonald on Flickr.

Stop petty crime, lower major crime in NYC, major crime went down

Freakonomics

Levitt & Dubner

- **Abortion legalized in 1973 - women least able to parent kids (poor, unstable, addictions) had access to abortion - reduced number of males ages 16-24 in poor communities (much debated)**
- **Or reduction in crack epidemic?**
- **Or high rate of incarceration due to new drug laws?**

The "broken window" theory Experiment - Keizer et al., *Science*, 2008

When people observe that others violate a social norm or legitimate rule, are they more likely to violate other norms or rules, and thus disorder spreads?

Independent measure - environment

Dependent measure - number of people who violate

white flyers attached





Source: Keizer, K., S. Lindenberg, and L. Steg. "The Spreading of Disorder." *Science* 322, no. 5908: 1681-5.

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white flyers attached

33% littered

69% littered





Source: Keizer, K., S. Lindenberg, and L. Steg. "The Spreading of Disorder." *Science* 322, no. 5908: 1681-5.

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Experimental and control group

- **1970's - Clofibrate to lower mortality from coronary artery disease**
- **Those who took drug 80% or more had a 15% mortality rate within 5 years**
- **Those who took drug less than 80% had a 25% mortality rate within 5 years**
- **Same for placebo!!!**
- **Self-selection bias**
- **importance of *random assignment of subjects & control conditions***

Who Is in Your Experiment?

- **Random recruitment; random assignment of people to conditions; generalize from a small specific group to human population as a whole**

 generalizable principles of human mind & behavior

Who Is in Your Experiment?

- Really random? Who volunteers?
- WEIRD research

 Westernized, Educated, Industrialized, Rich Democracies
- US college student 4000 times more likely research participant

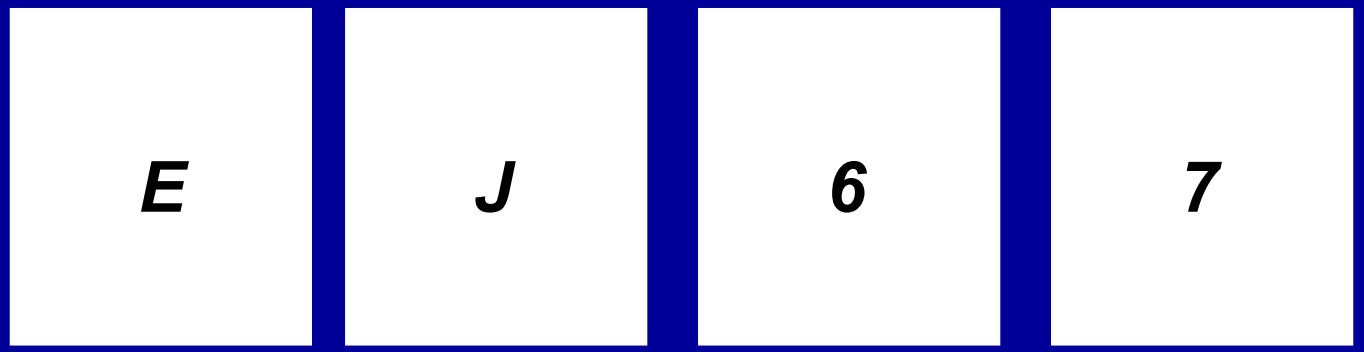
 generalizable principles of human mind & behavior?

Experimenter bias or demand characteristics

- 200 sheets of papers filled with random digits - add them pairwise - would take hours - did it for hours
- Or also pick up a card after each page that instructed them to tear the page into at least 32 places

Experimenter Effects

- Students told that rats were either "maze-bright" or maze-dull"
- Actually rats were just rats
- Students tested the rats on a maze
- "Maze-bright" rats performed significantly better than "maze-dull" rats!



Each card has a letter on one side, and a number on the other side.

If a card has a vowel on one side, then it has an even number on the other side.

Correct answer - E & 7 (10%)

Common answers - E, E & 6

Confirmation bias

We look for evidence that confirms what we believe, and overlook evidence that could disconfirm what we believe.

E - see an even number - confirm

6 - not even needed, but feels like it confirms

7 - would disconfirm - if there is a vowel on the other side

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- Williams & Bargh, *Science*, 2008
- "warm" and "cold" people - strongly influences how we see other people – *embodied cognition*

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- two temperature conditions

 meet subject in lobby, carry cup of coffee (hot/cold), clipboard, 2 textbooks, please hold cup while

 I write down your name

 (on elevator)

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- read a description of a person -

 "warm condition"

 rated person as "warmer"

 possible confound?

 (correlates with independent variable)

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- read a description of a person -

 "warm condition"

 rated person as "warmer"

 possible confound?

 experimenter knowledge/bias

LITTLE THINGS CAN INFLUENCE BEHAVIOR

hot/icy therapeutic pad - experimenter blind - rate pad - product evaluation

choose either Snapple beverage or 1$ gift certificate for ice-cream store for either YOU or A FRIEND

Cold pad - 75% for themselves (25% friend)

Warm pad - 46% for themselves (54% for friend)

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- $$$$$ - money

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- Vohs et al., 2006, *Science*
- thinking about money influences motivation & behavior towards others
- Exp 1 – descrambling task

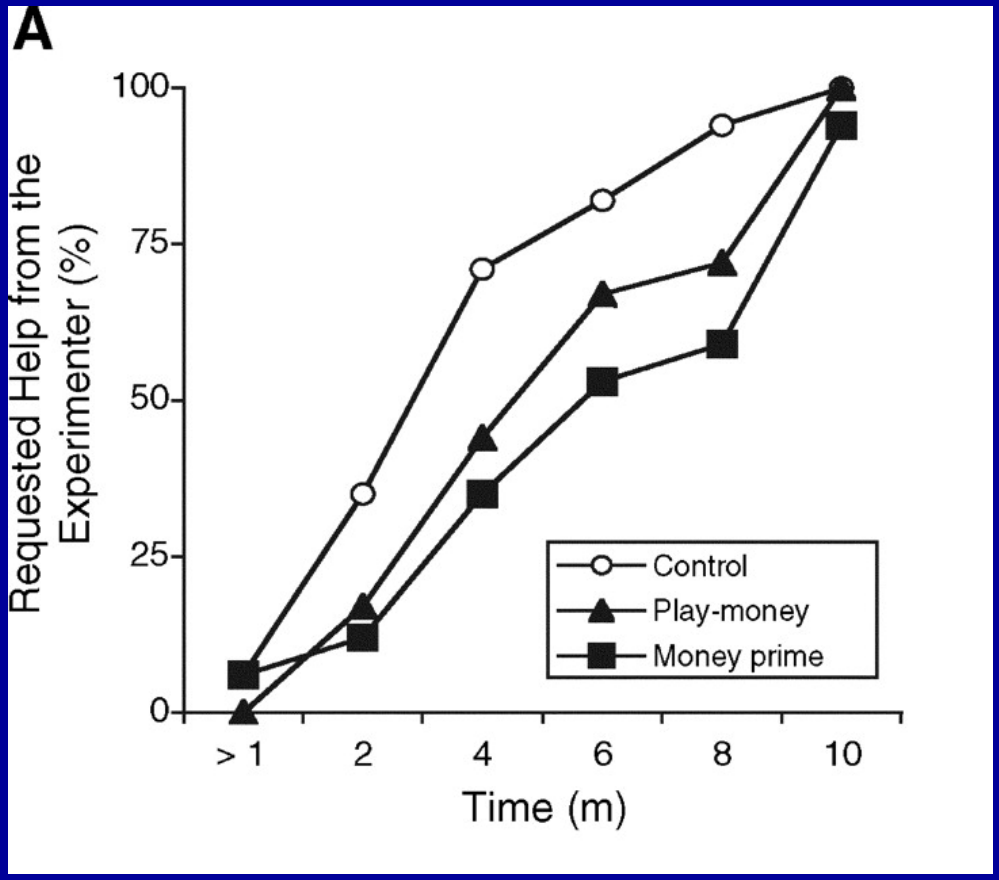
(neutral) *cold it desk outside is* OR

(money*) high a salary desk paying OR*

(neutral +$) – stack of Monopoly $$ in corner

Hard task – 12 disks into square with 5 per side; experimenter offers help, leaves room; time to ask for help

Percentage of participants who asked for help as a function of money prime and length of time that had elapsed while working on a difficult task (from Experiment 1) or (B)



Source: Vohs, K. D., et al. "The Psychological Consequences of Money." *Science* 314, no. 2206: 1154-6. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- Vohs et al., 2006, *Science*
- thinking about money influences motivation & behavior towards others
- thinking about money makes people more self-sufficient (reduced requests for help) & reduced helpfulness toward others (help experimenter code data sheets 42 min after neutral vs. 25 min in $$$ conditions)

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- dating between men and women
- who is more selective in their dating choices?
- evolutionary psychology perspective
 (investment in offspring)
- but how could we know who is more selective?

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- dating between men and women
- who is more selective in their dating choices?
- evolutionary psychology perspective
 (investment in offspring)
- but how could we know who is more selective?
 - *on-line dating*
 - *speed dating*

LITTLE THINGS CAN INFLUENCE BEHAVIOR

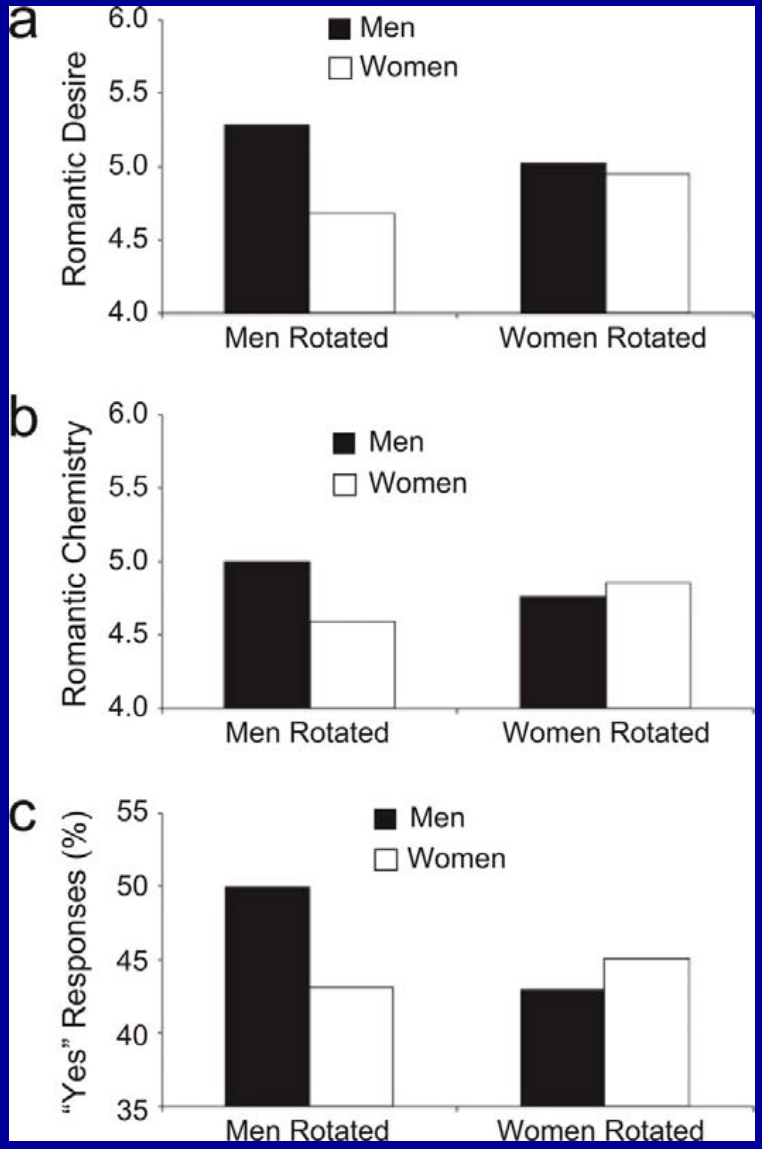
- dating between men and women
- who is more selective in their dating choices?
- but how could we know who is more selective?

 - *on-line dating*; men 1.5x more likely to send email offering date
 - *speed dating*; 4 min; yes/no match cards; men make more yes responses

LITTLE THINGS CAN INFLUENCE BEHAVIOR

- dating between men and women
- - *speed dating*; 4 min; yes/no match cards*;* men make more yes responses
- men rotate from table to table of women
- is it man/woman or approach/receive?

Men's and women's (a) romantic desire for their speed-dating partners, (b) romantic chemistry with their partners, and (c) percentage of "yes" responses to their partners as a function of which sex rotated



Source: Finkel, E. J., and P. W. Eastwick. "Arbitrary Social Norms Influence Sex Differences in Romantic Selectivity." *Psychological Science* 20 (2009):1290-5. © Association for Psychological Science.
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Group Effects

- **Group Effects**

 sex, age, culture, genes

 are these independent variables?

Individual Differences

- many studies also examine individual differences among people

Folk Psychology & Scientific Psychology

- *everybody* has ideas about how they think and behave and how other people think and behave
- *scientific psychology* sometimes supports and sometimes contradicts these ideas

Ideas About People & Psychology

1. *Opposites attract, on average*	Yes	No
2. *Familiarity breeds contempt, on average*	Yes	No
3. *The more people present at an emergency, the more likely that someone will intervene*	Yes	No
4. *There are visual learners and there are verbal learners*	Yes	No
5. *Hypnosis is baloney*	Yes	No
6. *Subliminal advertising works*	Yes	No
7. *Playing Mozart's music to infants boosts their intelligence*	Yes	No
8. *Old age, on average, is associated with dissatisfaction*	Yes	No
9. *If you are unsure of your answer when taking a test, it's best to stick with your initial hunch*	Yes	No
10. *Ulcers are caused primarily by stress*	Yes	No
11. *A positive attitude can stave off cancer*	Yes	No
12. *Raising children similarly leads to similarities in their adult personalities*		
13. *Low-self esteem is a major cause of psychological problems*	Yes	No
14. *People's responses in the Inkblots Test tells us a great deal about their personalities*	Yes	No
15. *Interviews help identify those most likely to succeed in medical school*	Yes	No

Ideas About People & Psychology

1. *Opposites attract, on average*	No
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An inkblot used in the Rorschach test

Projective Tests

Rorschach inkblots (10)

- Location
- Determinants (form, color)
- Content

Thematic Apperception Test (TAT)

Validity? After 10,000 papers, no

Medical School Interviews

Yale

- Compare students who were accepted or rejected on the basis of an interview but went elsewhere to the same schools (why same schools?)
- No difference

Medical School Interviews

April, 1979

- University of Texas at Houston enlarged from 150 to 200 students
- 150 selected by looking at 2200 applications, picking 800
- 800 invited for interviews
- All 150 who came were among top 350 choices
- 50 students came from last 700-800 - how did they do?
- No differences in performance at all

SELF ESTEEM

- high self-esteem sounds good to everybody
- higher self-esteem is correlated with (a) initiative & persistence & (b) happiness & emotional resilience & (c)narcissism & bullying
- Baumeister et al., 2003 – reviewed 15,000 studies – no evidence to support view that self-esteem is causal (higher self-esteem may be a product rather than a cause of positive things)

How Praise May Harm

How Praise May Harm

- Carol Dweck - 5th graders
- perform a hard task - correct & incorrect examples
 - praise for intelligence
 - praise for hard work
 - no praise (control)
- perform a harder task

How Praise May Harm

- Carol Dweck - 5th graders
- performance on 2nd task
 - praise for intelligence
 performance declined
 - praise for hard work
 performance improved
 - control/no praise
 performance did not change

How Praise May Harm

praise for intelligence (vs. effort)

- worse performance
- care more about performance than about learning
- less task persistence
- less task enjoyment
- more low-ability attributions
- trait (fixed) vs. effort (growth)

Psychology & Science

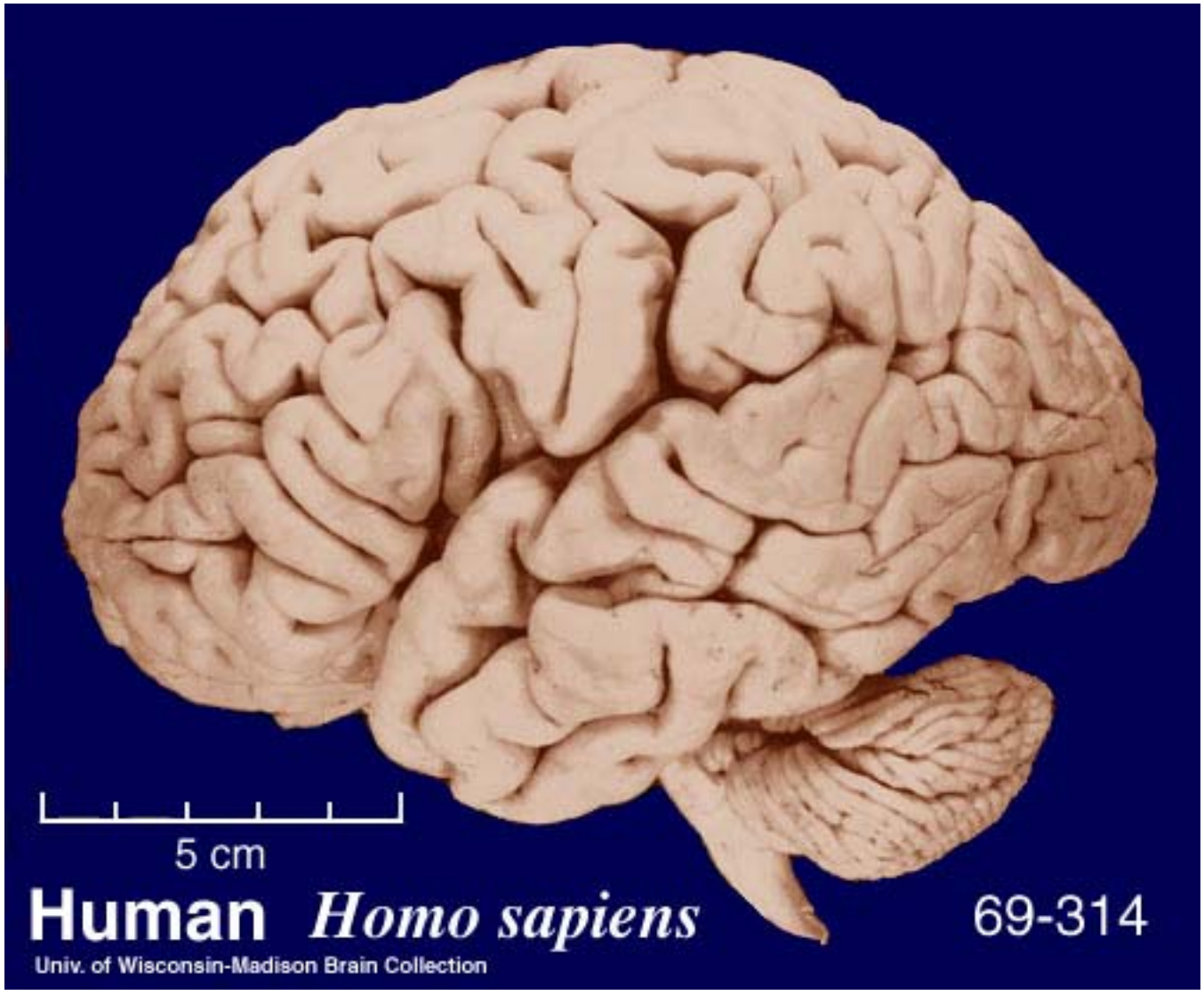
- what is science
- what is an experiment
- very brief history of psychology experimentation
- some issue in experimentation
- some psychological topics

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9.00SC Introduction to Psychology
Fall 2011

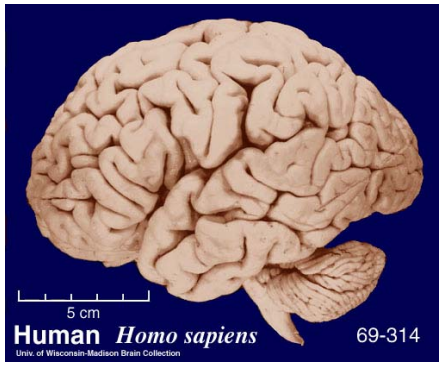
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9.00 The Brain



Professor John Gabrieli

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Human Brain

- neurons
- gross anatomy

Localization of mental functions in human brain

- phrenology
- Phineas Gage, moral behavior, orbitofrontal cortex
- Broca, Tan, and left lateralization of language

Hemispheric Specialization - parallel processing

- appearance (right) vs. function (left)
- global (right) vs. local (left)

BRAIN & MIND

Plato

rational soul in brain - part of the mind nearest to the heavens

Aristotle

warm and active heart houses the mind

cool and inert brain cools the blood

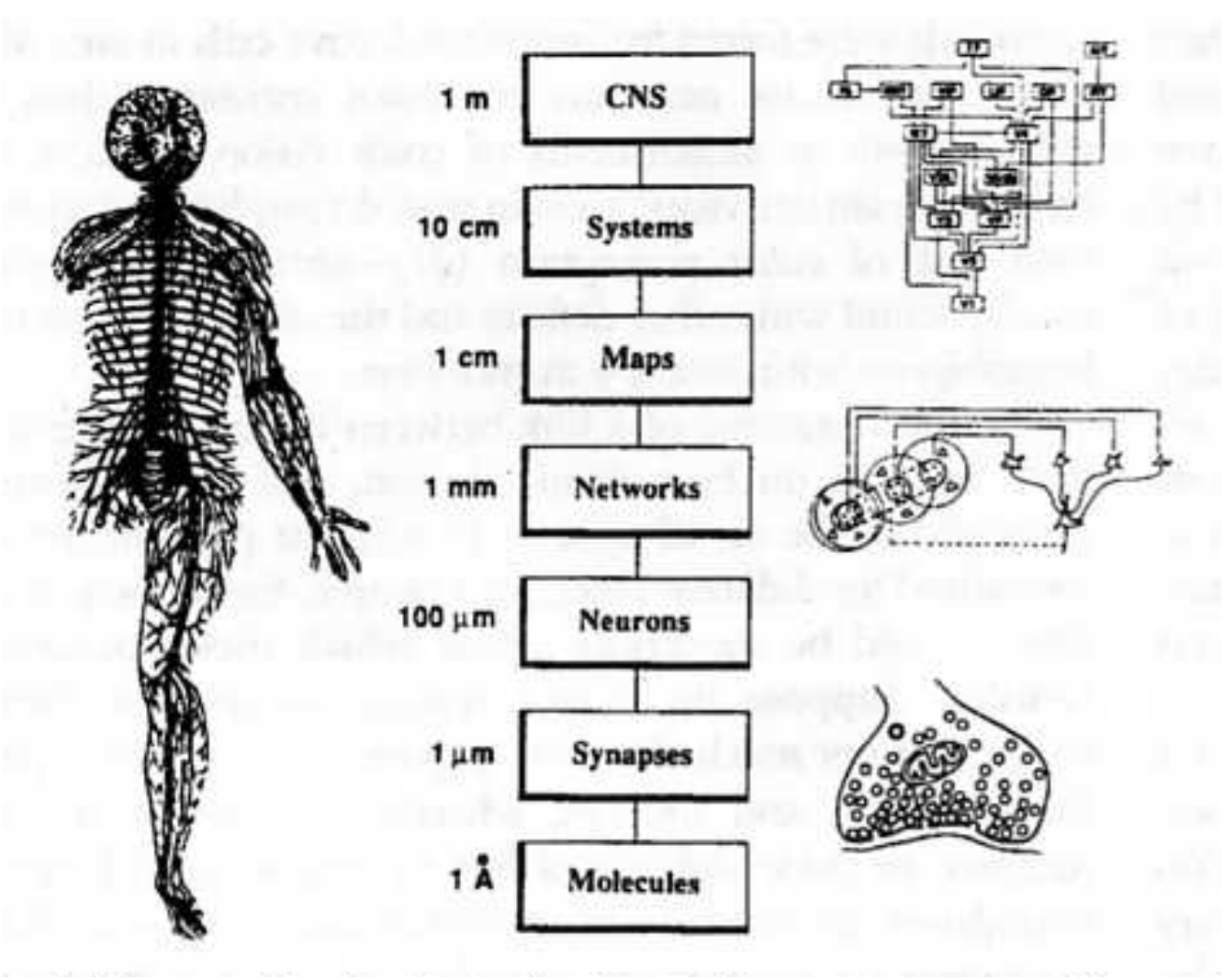
Galen

brain - mind in fluid filled ventricles

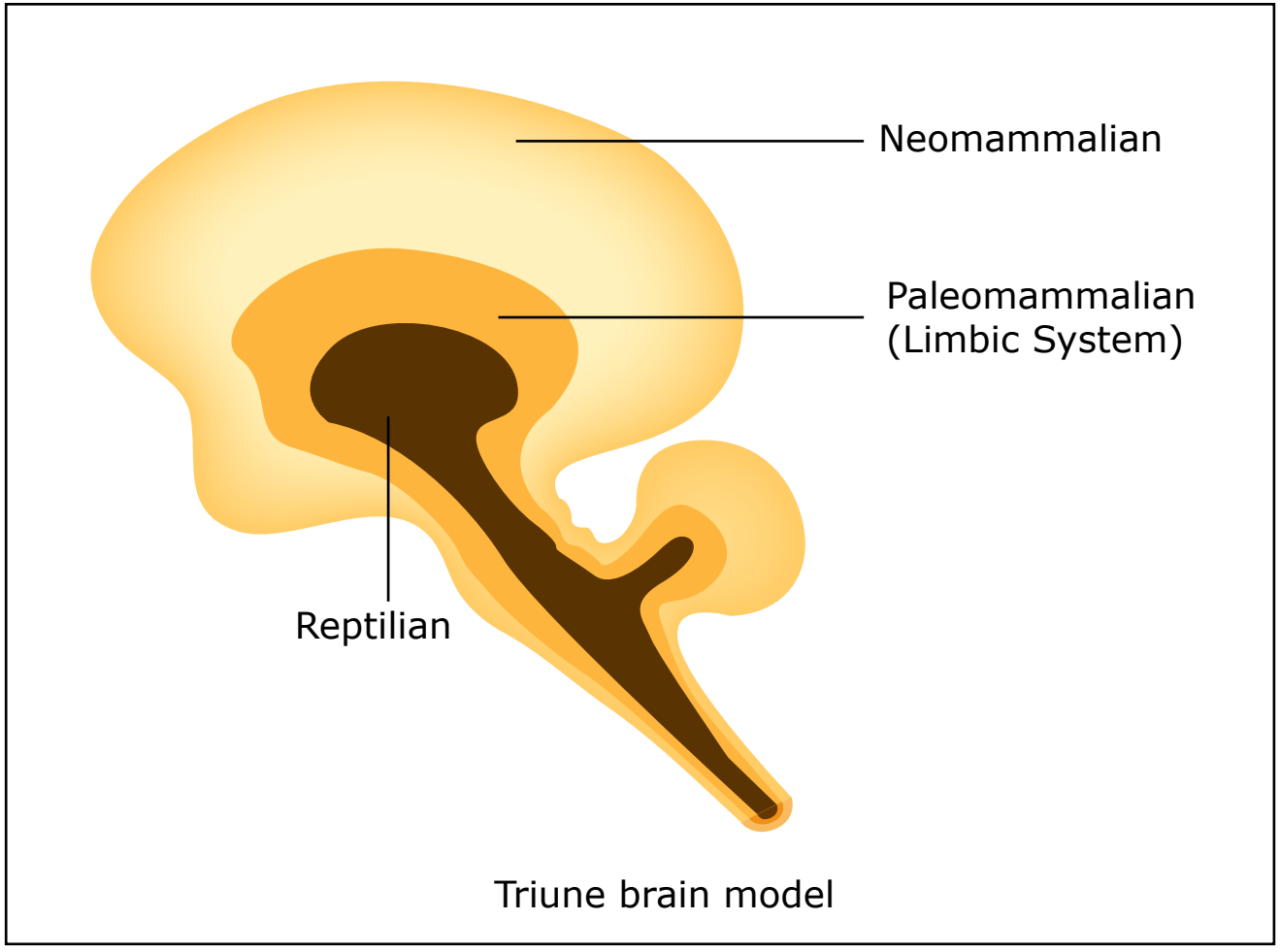
Descartes

pineal body - not composed of two symmetric halves, near ventricles

Levels of Analysis
Molecules/Synapses/Neurons/Networks/ Maps/Systems/CNS



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Triune brain model

Image by MIT OpenCourseWare.

THE BRAIN

Neuronal Computational Elements

1. glia & neurons

2. neuron
 - • soma = cell body = grey matter
 - • axon = output = white matter
 - • dendrite = input
 - • synapses & neurotransmitters
 - • collection of cell bodies = nucleus
 - • collection of axons = tract

THE BRAIN (cont'd)

3. CNS has about 1,000,000,000,000 neurons & 1,000,000,000,000,000 synapses; 62,000 miles of myelinated axons; 100,000 miles of dendrites

4. up to 15,000 connections per cell

- **average neuron may have about 1,000 synapses**
- **average axon may synapse on about 1,000 neurons**

5. each of the 100 billion neurons may have the processing capacity of a medium-sized computer - computes about 1000 multiplications and additions every 10 msec

6. time for information to go from one neuron to another about 10 msec - slower than millions of operations per second by fast computers - but billions of such neuronal computers yields massively parallel processing in the brain

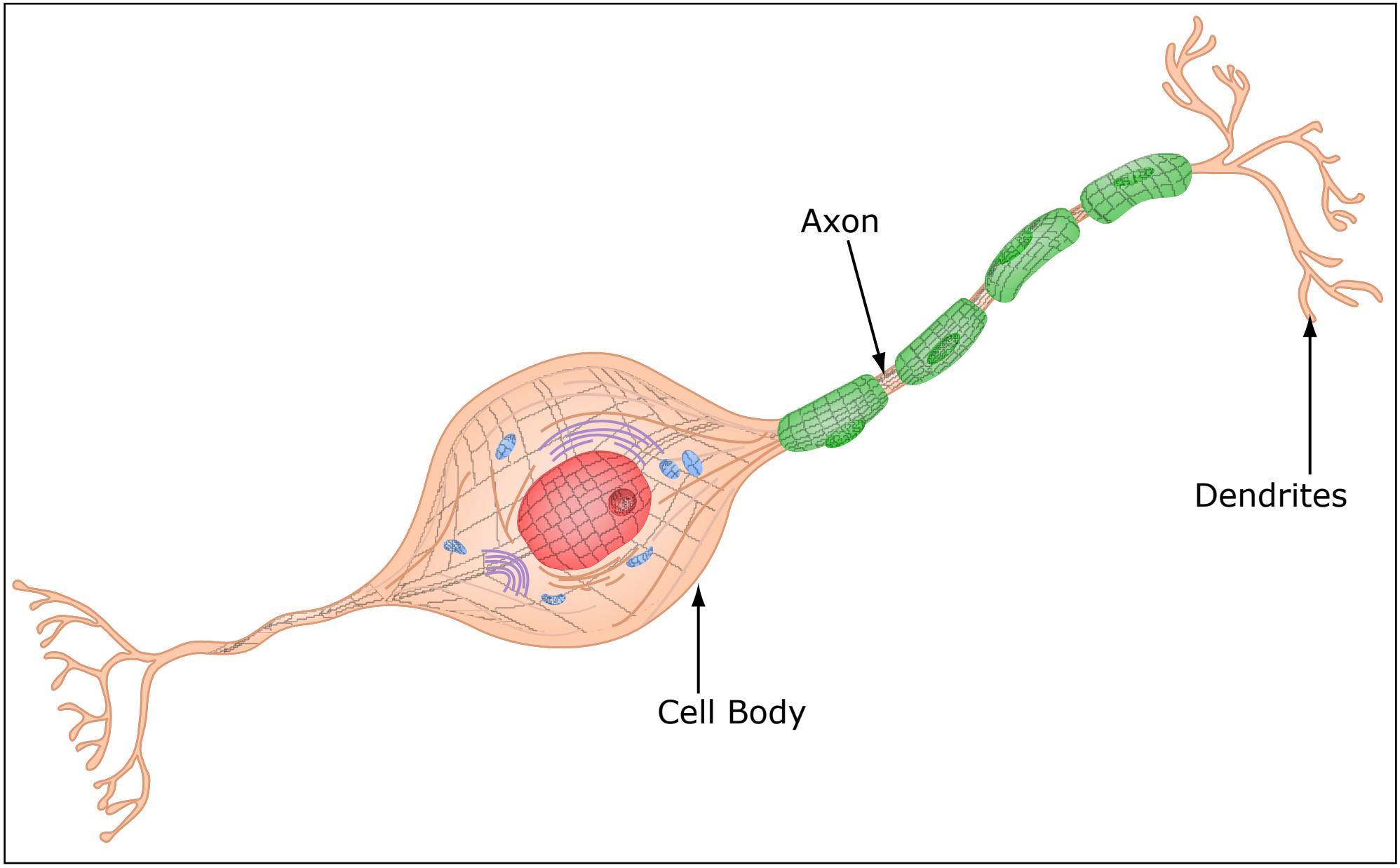


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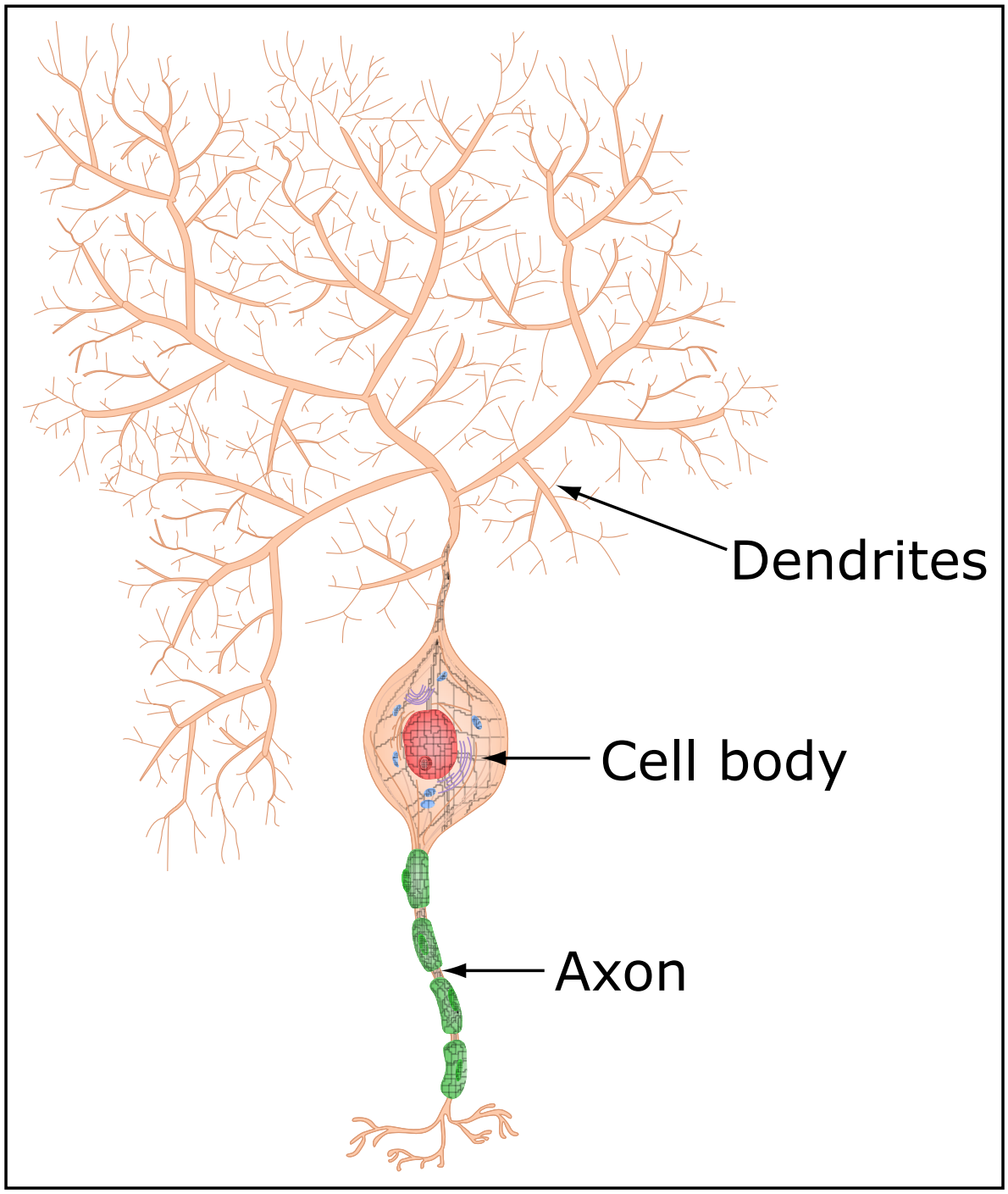


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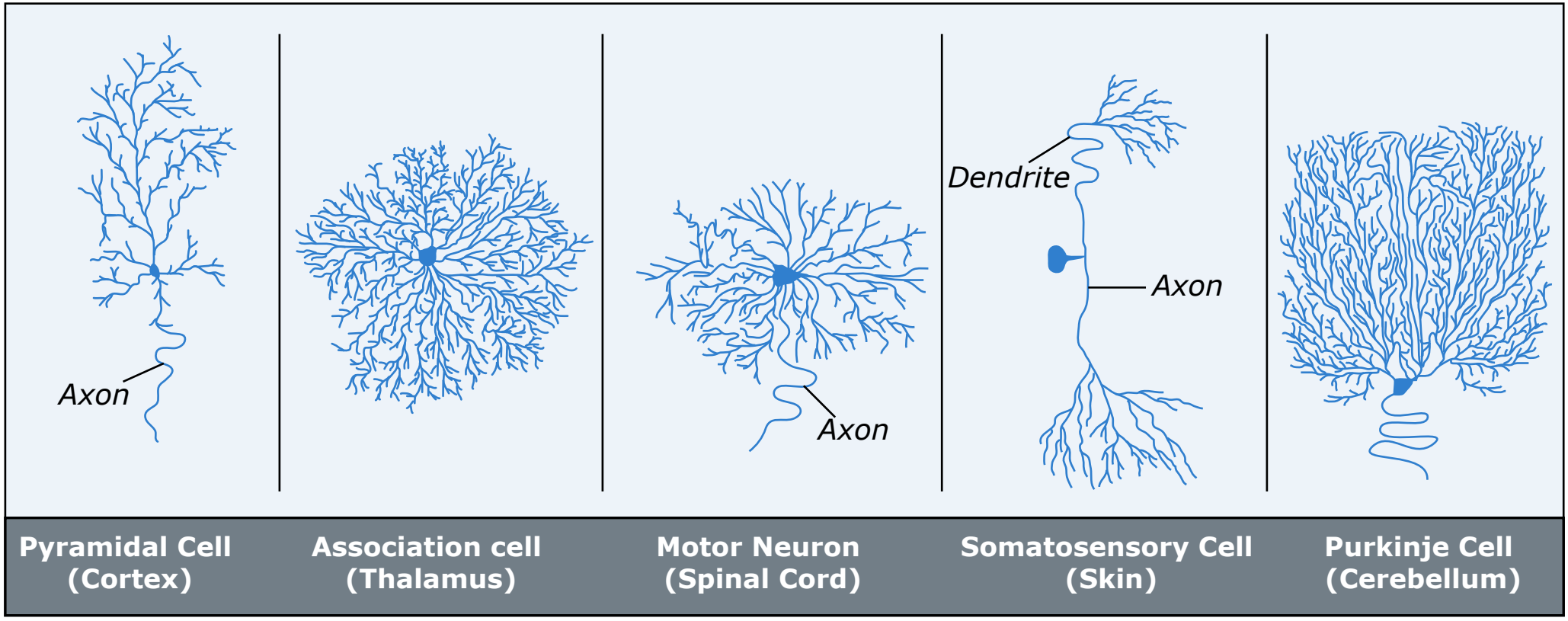
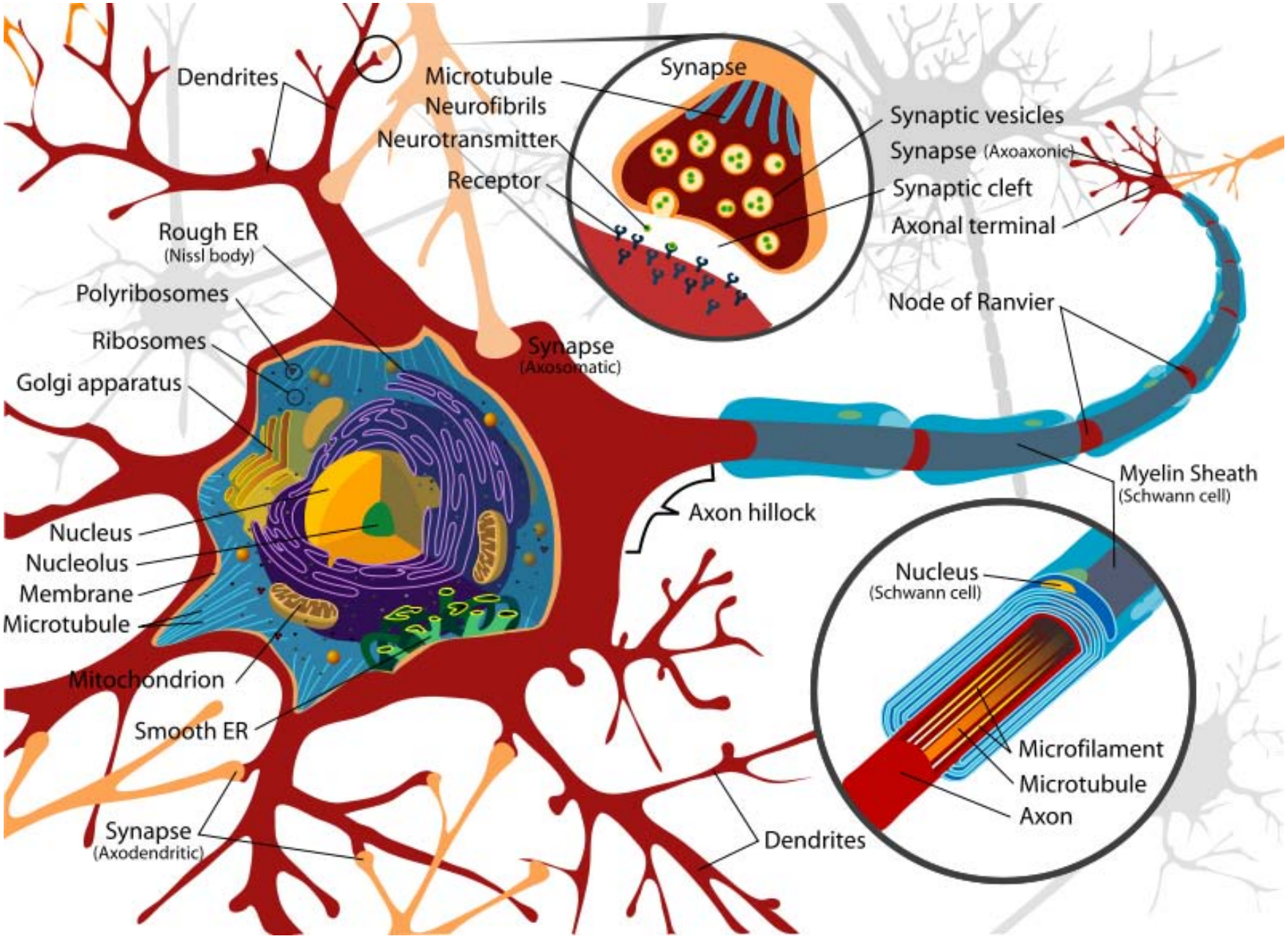
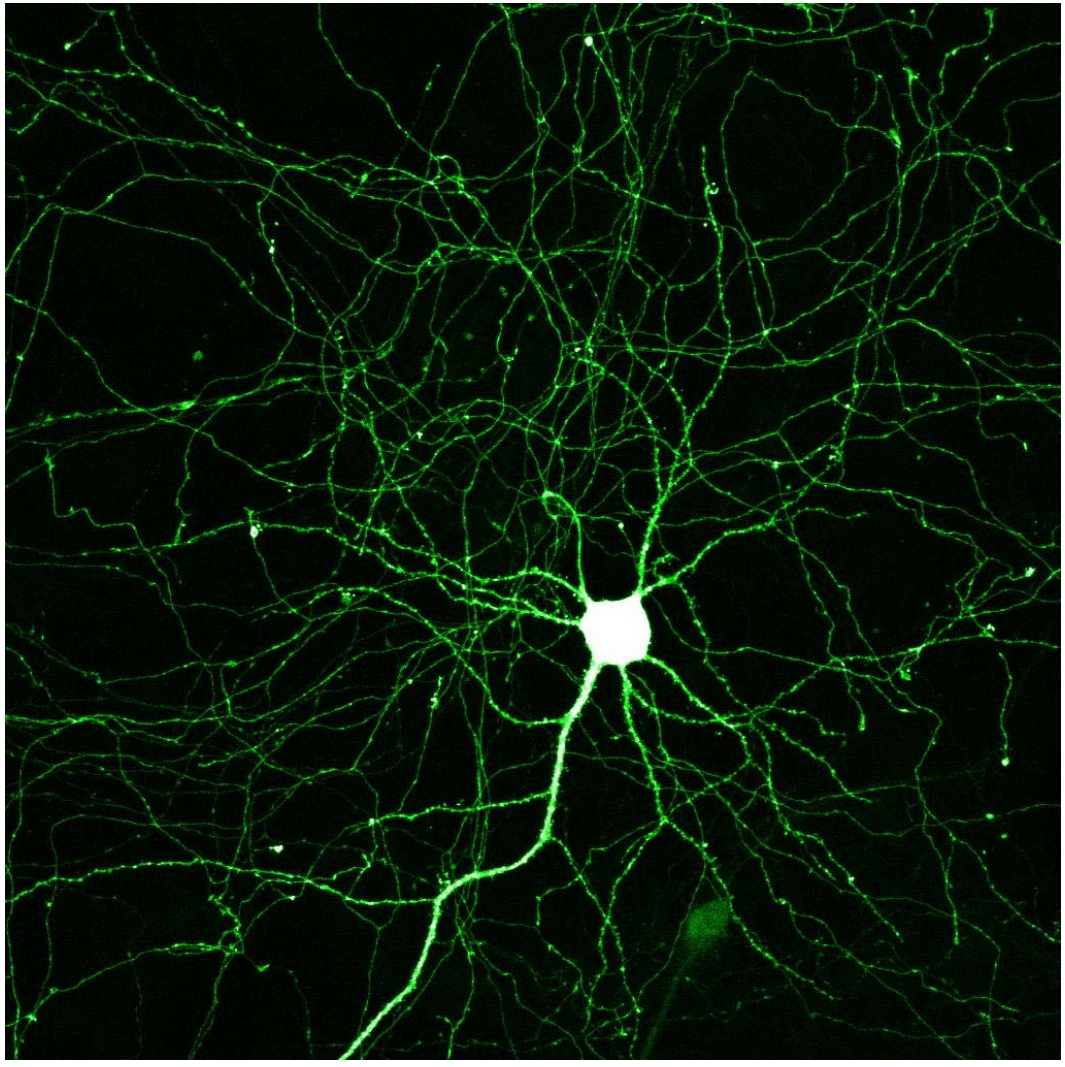


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Neuron



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Synapse

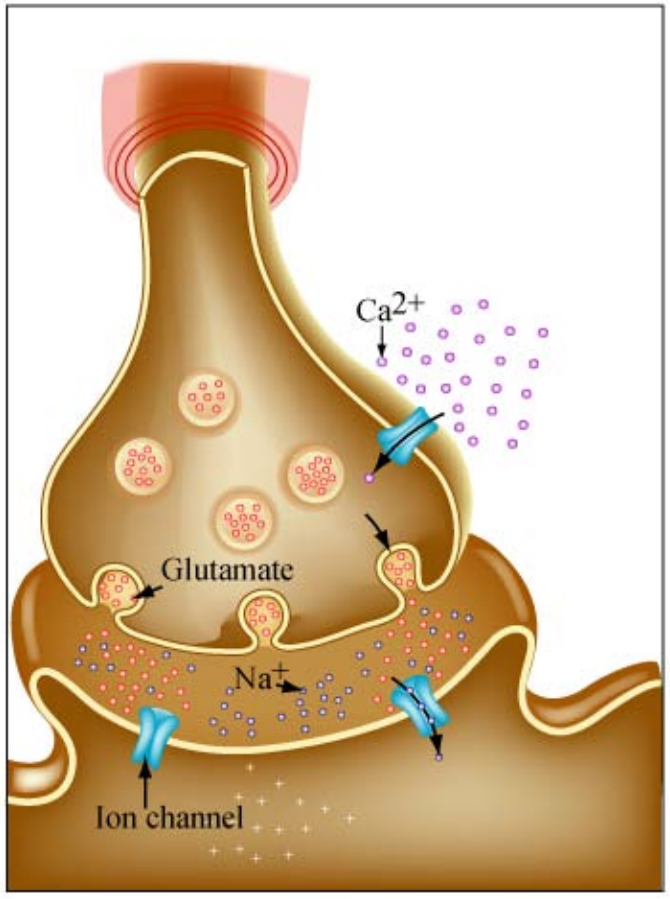
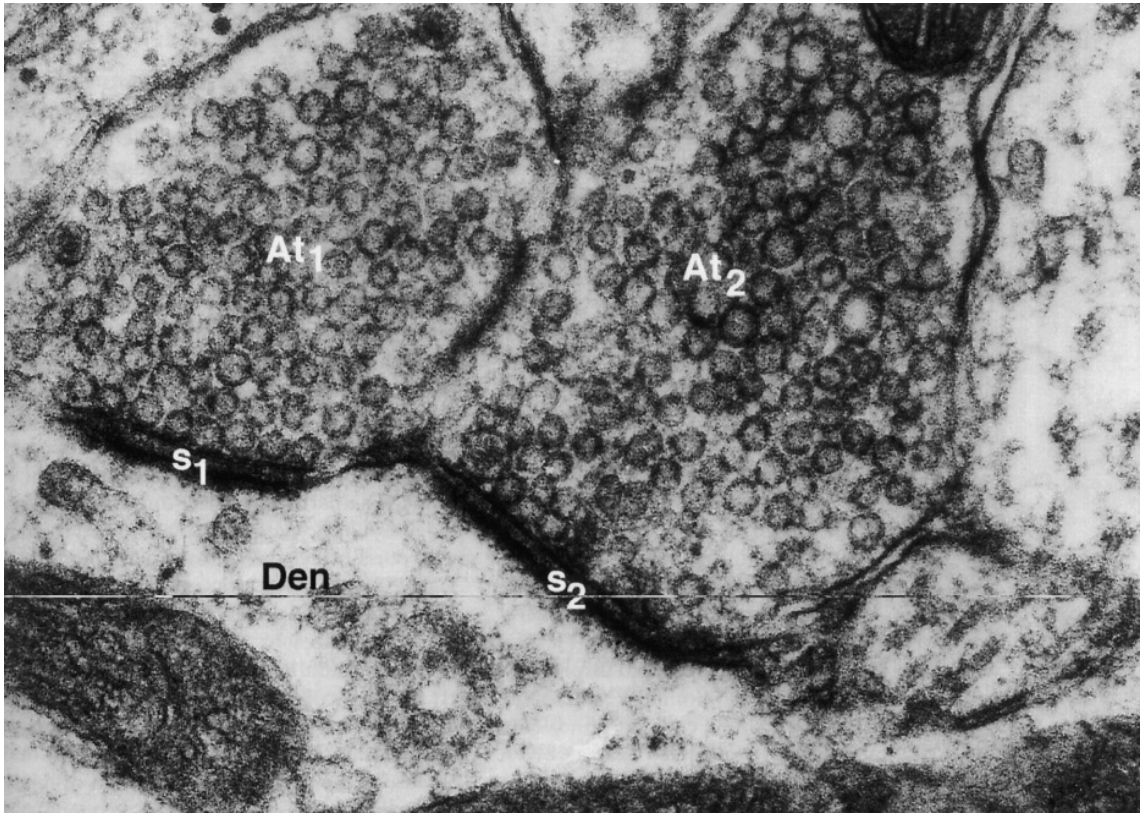
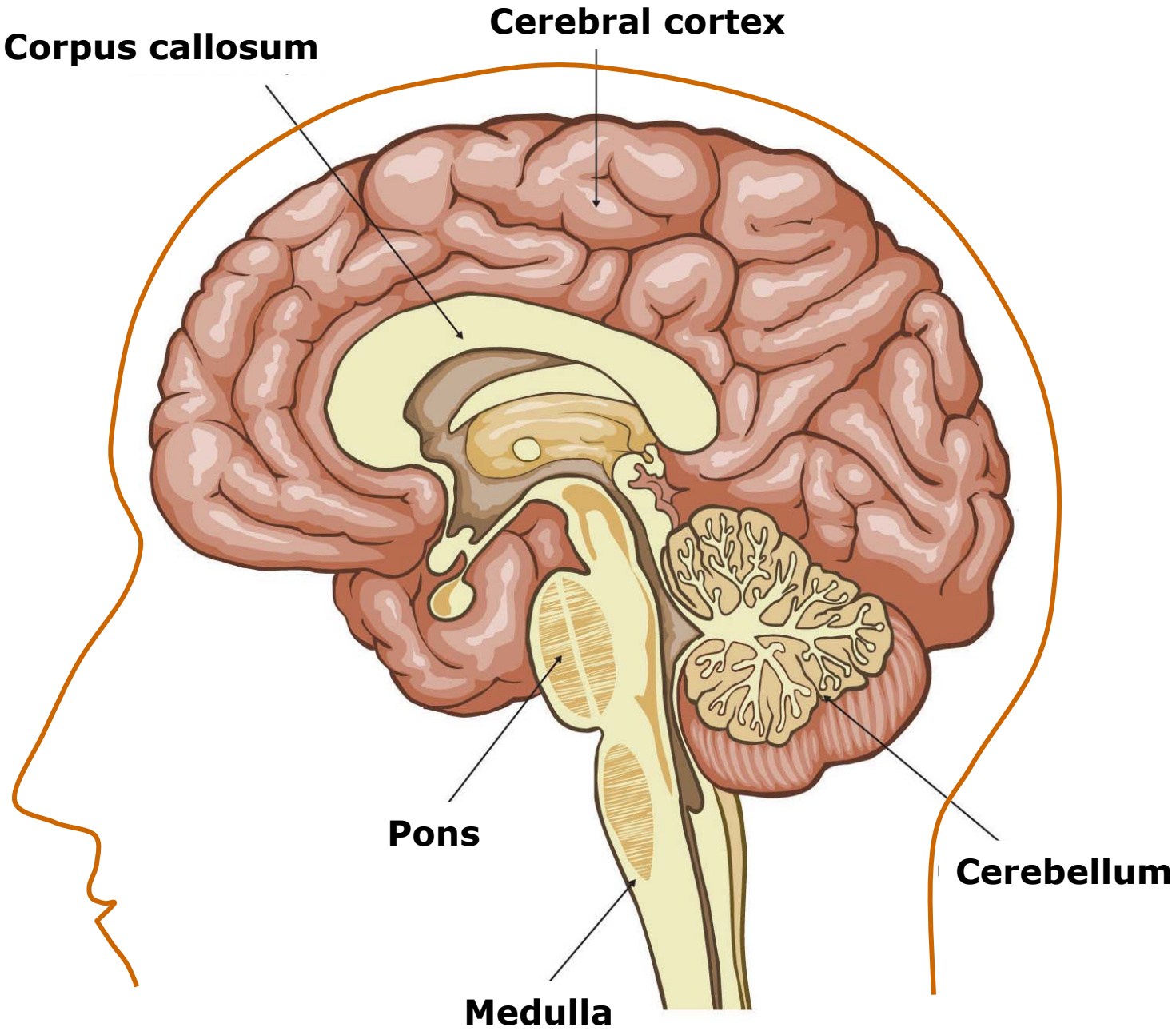


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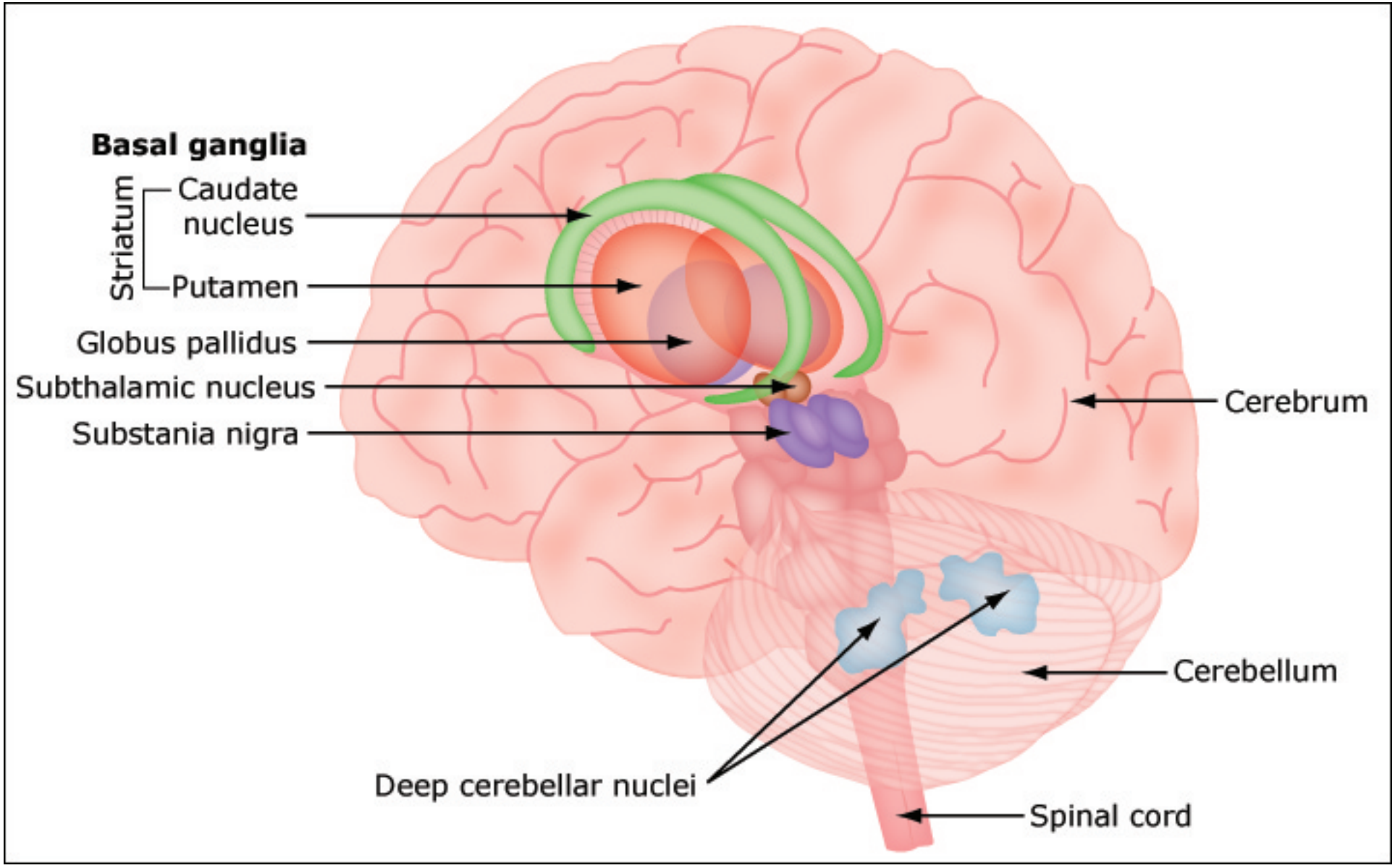
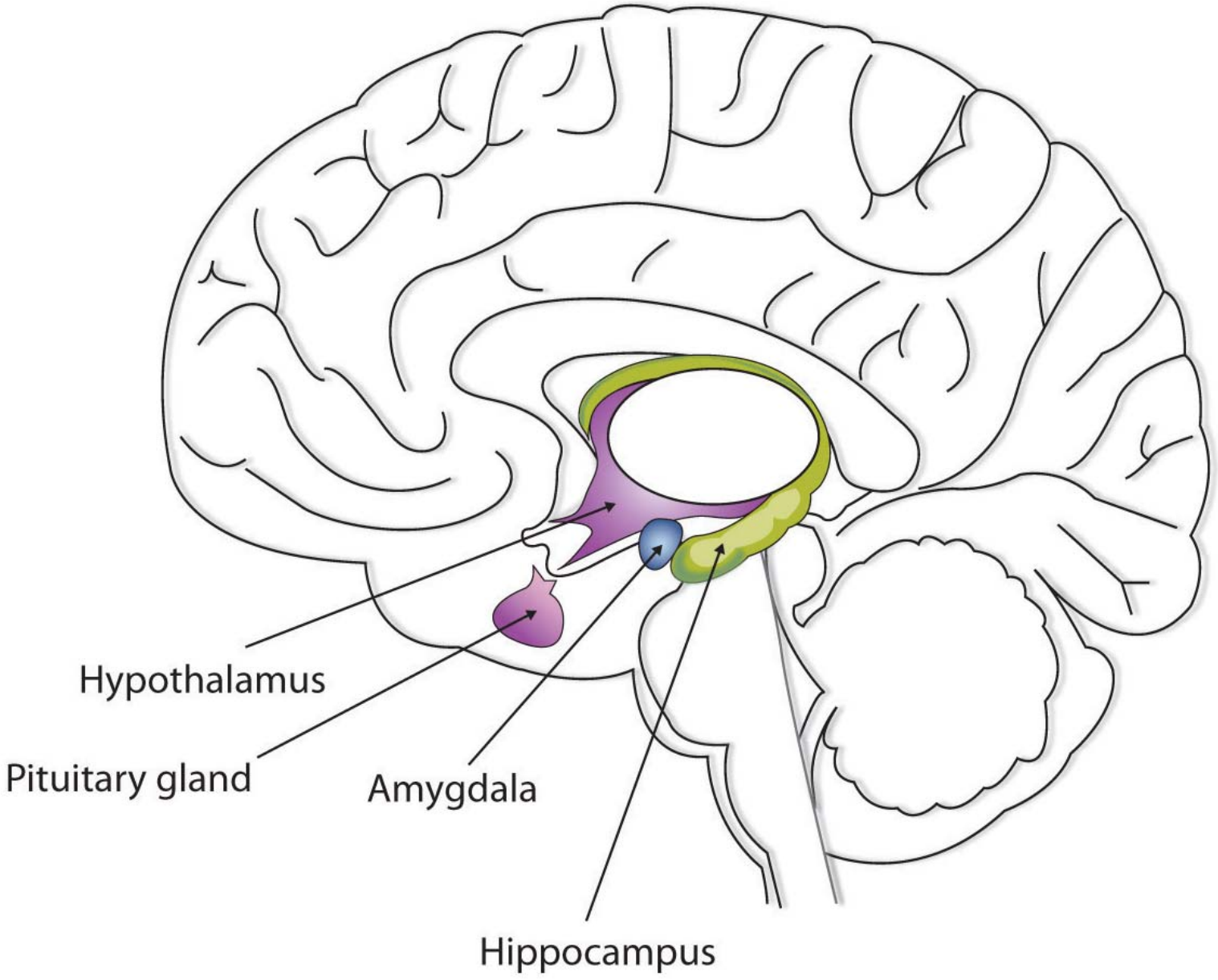
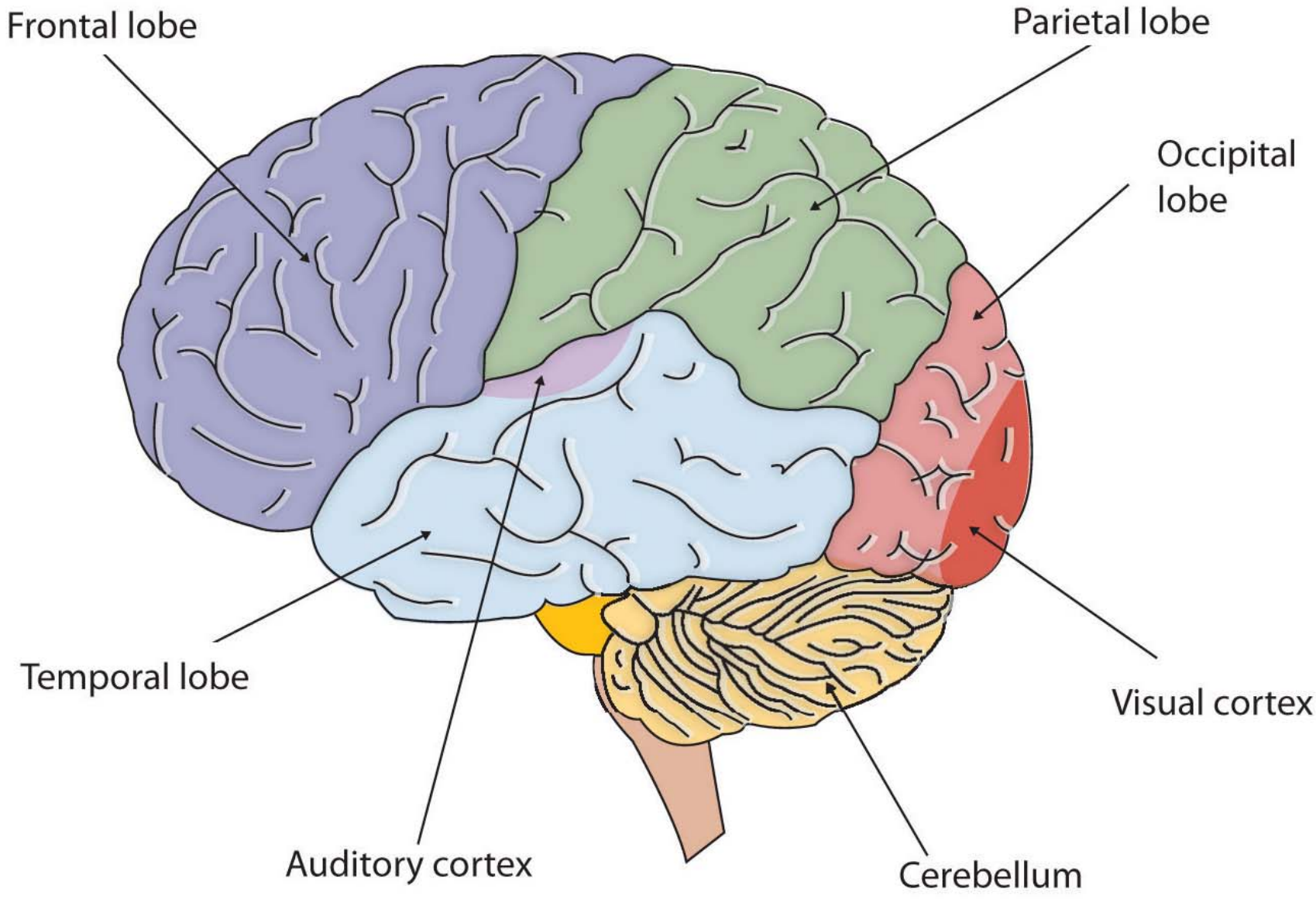


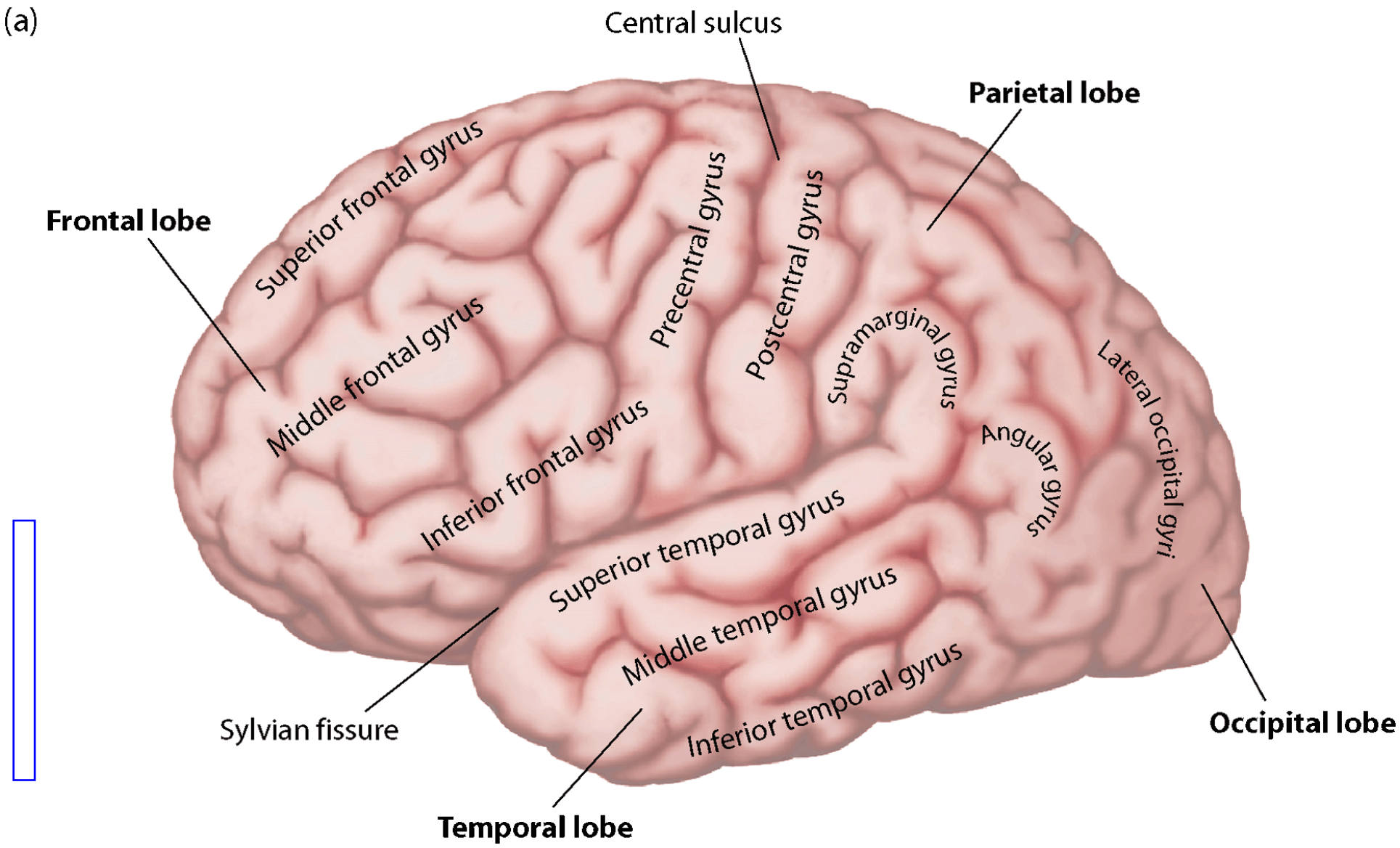
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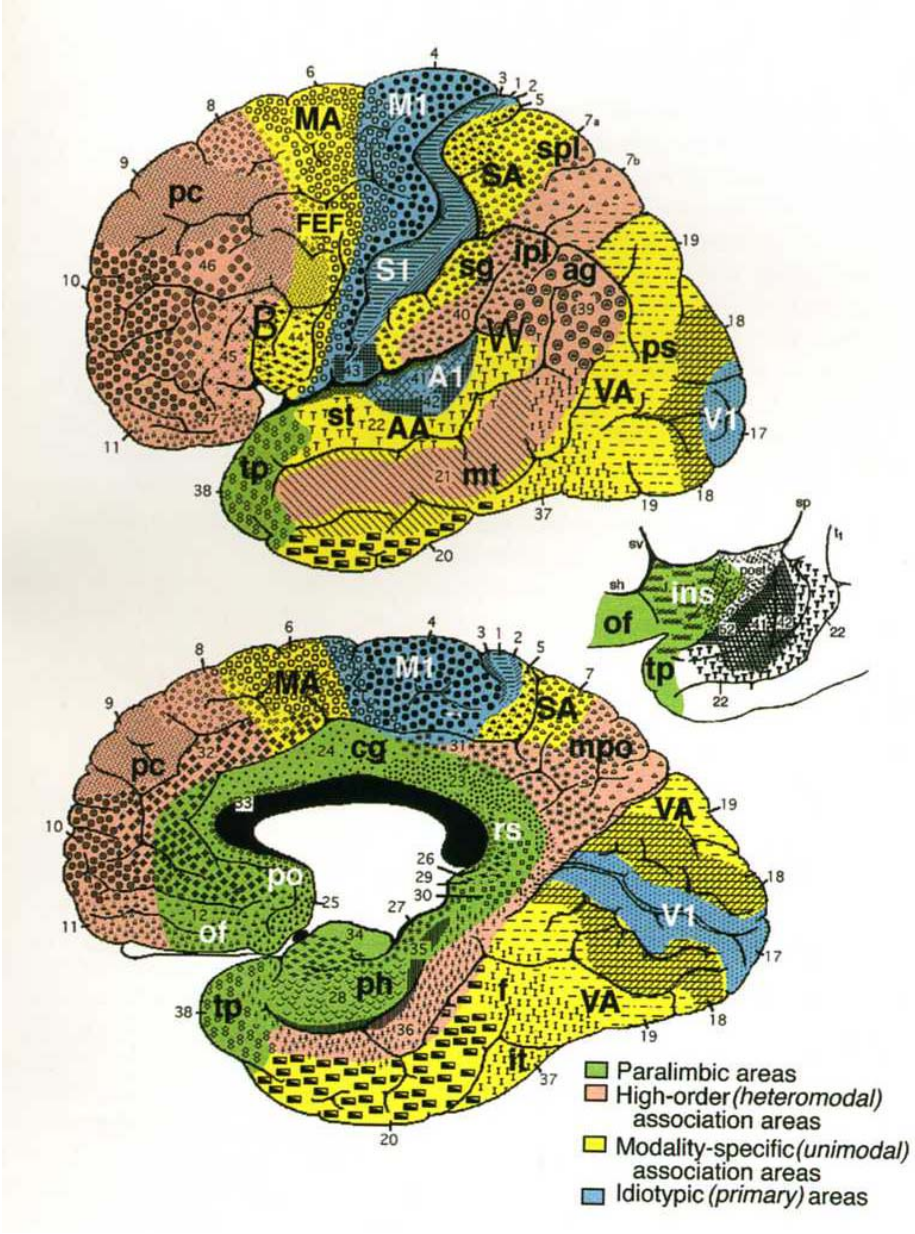
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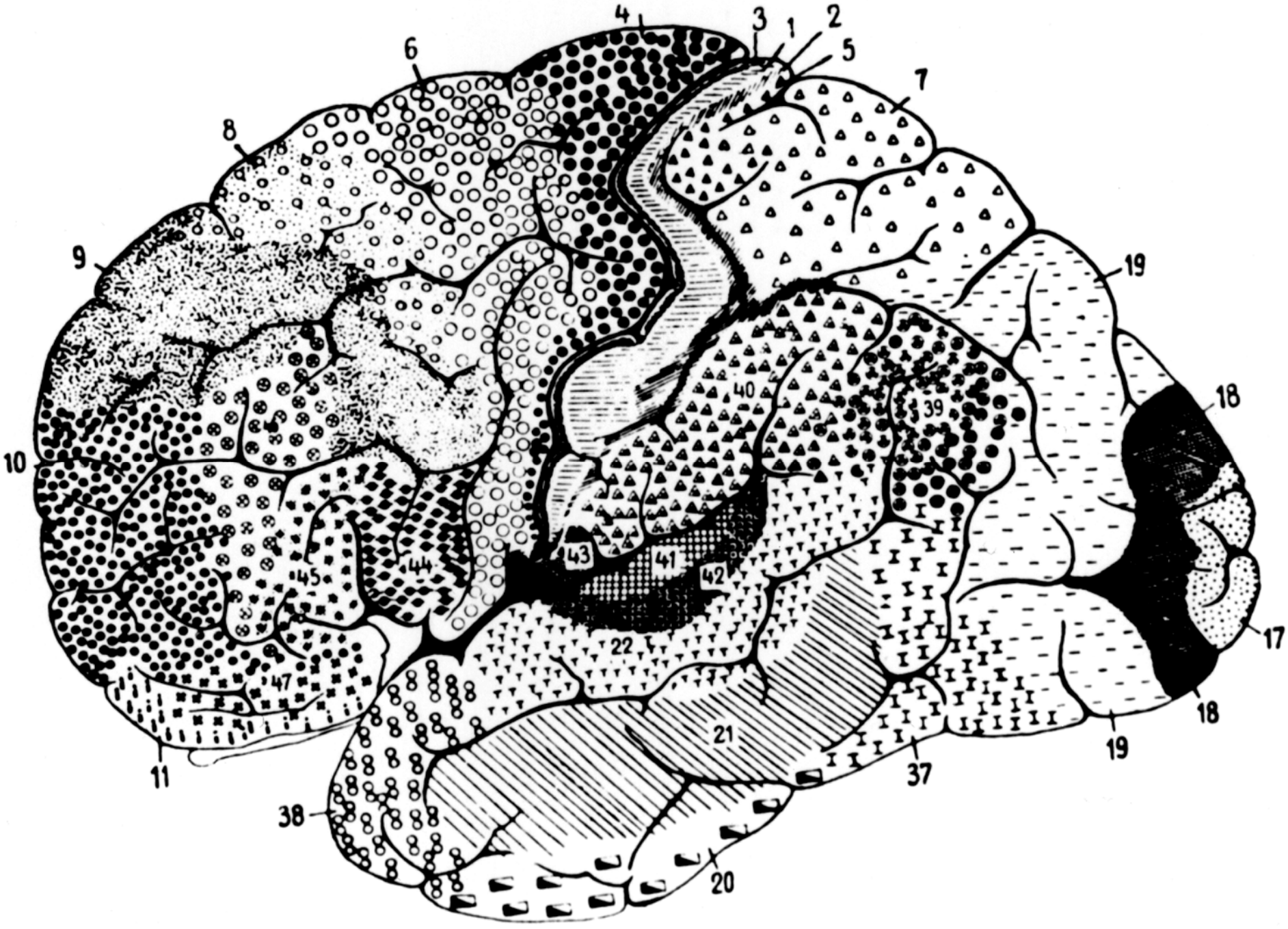


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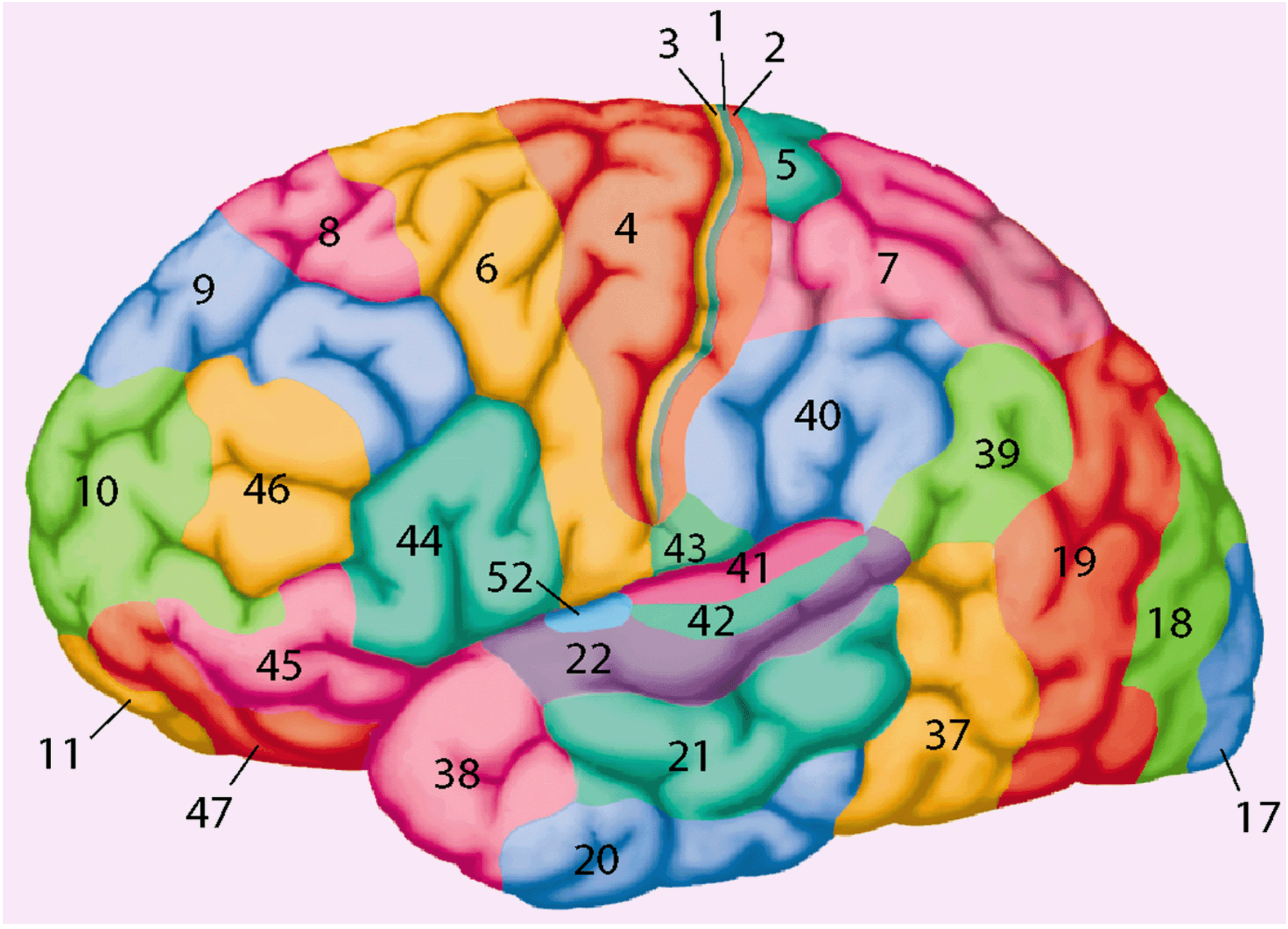


Distribution of functional zones in relationship to Brodmann's map of the human brain

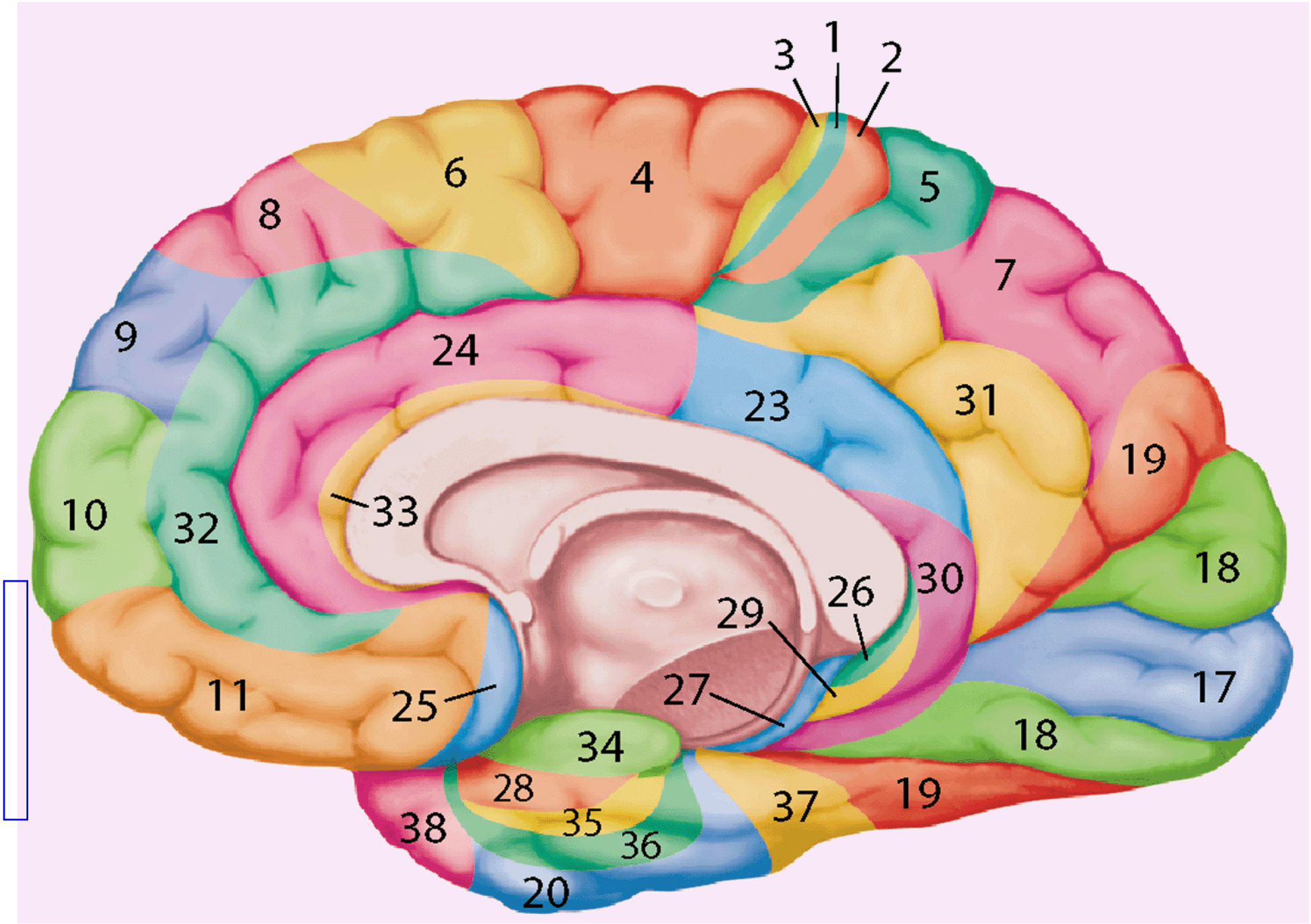
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Localization of Function

Distributed/Local

Franz Joseph Gall
(1758-1828)



Public domain image.

“Science” of Phrenology
19th century

LOCALIZATION & PHRENOLOGY

- **Franz Gall (1758-1828)**
- **Johann Casper Spurzheim (1776-1832)**

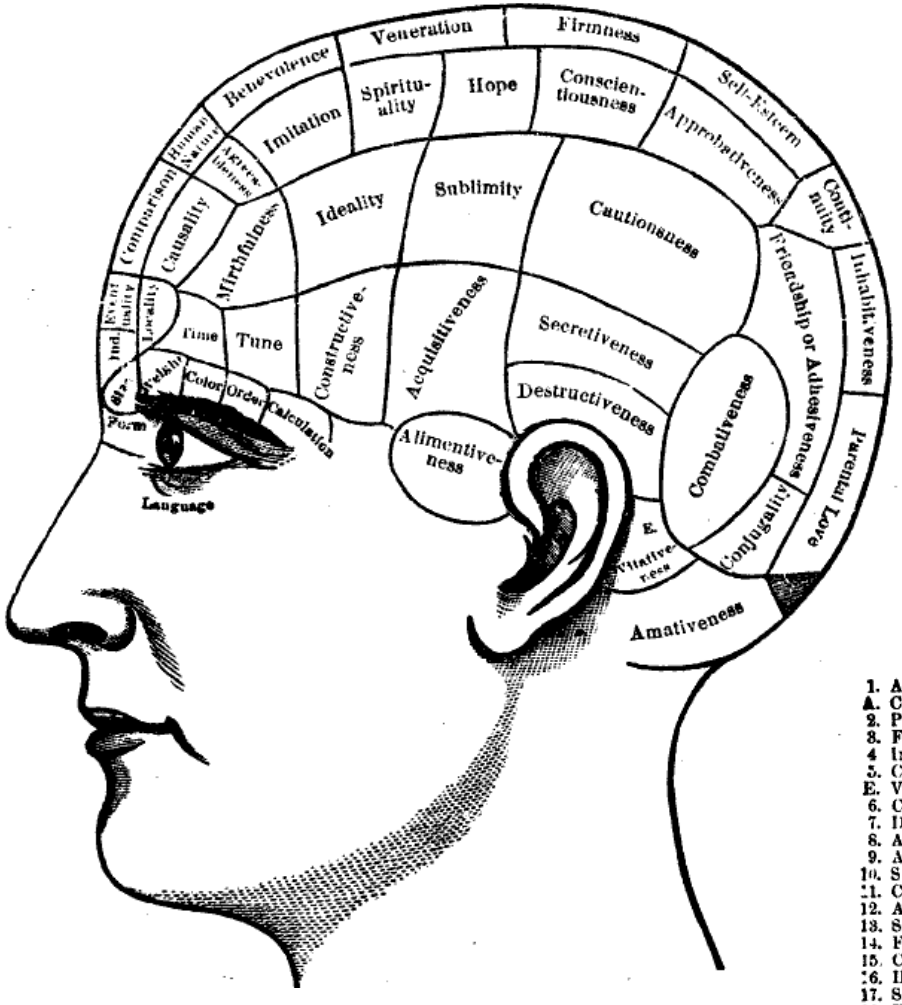
good neuroanatomists

- **cortex is composed of cells connected to subcortical structures**
- **crossing of the pyramidal tracts & gray/white matter in spinal cord**
- **symmetrical hemispheres connected by commissures**

not so good neuropsychologists

- **behavioral phrenology - amativeness, combativeness, acquisitiveness**
- **Gall - language localized to below the orbit due to a soldier with a knife wound that penetrated left frontal-lobe and become aphasic**

Phrenology



NUMBERING AND DEFINITION OF THE ORGANS.

1. AMATIVENESS, Love between the sexes.
A. CONJUGALITY, Matrimony—love of one. [etc.
2. PARENTAL LOVE, Regard for offspring, pets,
3. FRIENDSHIP, Adhesiveness—sociability.
4 INHABITIVENESS, Love of home
5. CONTINUITY, One thing at a time.
E. VITATIVENESS, Love of life.
6. COMBATIVENESS, Resistance—defense.
7. DESTRUCTIVENESS, Executiveness—force.
8. ALIMENTIVENESS, Appetite—hunger.
9. ACQUISITIVENESS, Accumulation.
10. SECRETIVENESS, Policy—management.
11. CAUTIOUSNESS, Prudence—provision.
12. APPROBATIVENESS, Ambition—display.
13. SELF-ESTEEM, Self-respect—dignity.
14. FIRMNESS, Decision—perseverance.
15. CONSCIENTIOUSNESS, Justice equity.
16. HOPE, Expectation—enterprise.
17. SPIRITUALITY, Intuition—faith—credulity.
18. VENERATION, Devotion—respect.
19 BENEVOLENCE, Kindness—goodness.
20. CONSTRUCTIVENESS, Mechanical ingenuity
21. IDEALITY, Refinement—taste—purity.
B. SUBLIMITY, Love of grandeur—infinitude.
22. IMITATION, Copying—patterning.
23. MIRTHFULNESS, Jocoseness—wit—fun.
24. INDIVIDUALITY, Observation.
25. FORM, Recollection of shape.
26. SIZE, Measuring by the eye.
27. WEIGHT, Balancing—climbing.
28. COLOR, Judgment of colors.
29. ORDER, Method—system—arrangement
30. CALCULATION. Mental arithmetic.
31. LOCALITY, Recollection of places.
32. EVENTUALITY, Memory of facts.
33. TIME, Cognizance of duration.
34. TUNE, Sense of harmony and melody.
35. LANGUAGE, Expression of ideas.
36. CAUSALITY, Applying causes to effect. [tion.
37. COMPARISON, Inductive reasoning—illustra-
C. HUMAN NATURE, Perception of motives.
D. AGREEABLENESS, Pleasantness—suavity

Public domain image. From O. S., and L. N. Fowler. *The Self-Instructor in Phrenology and Physiology* (1889).

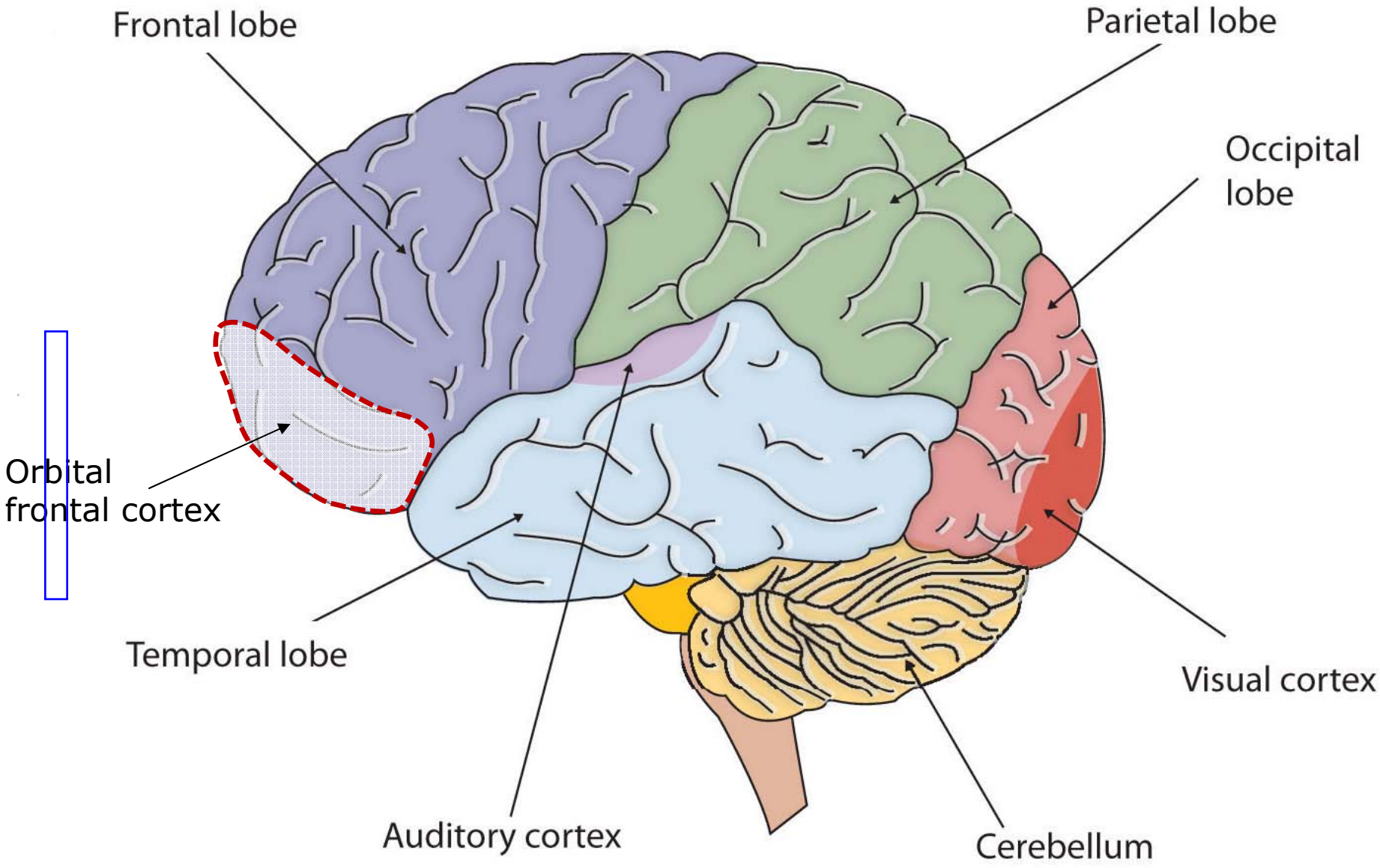
Phrenometer

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"Woman Using a Lavery Electric Automatic Phrenometer."

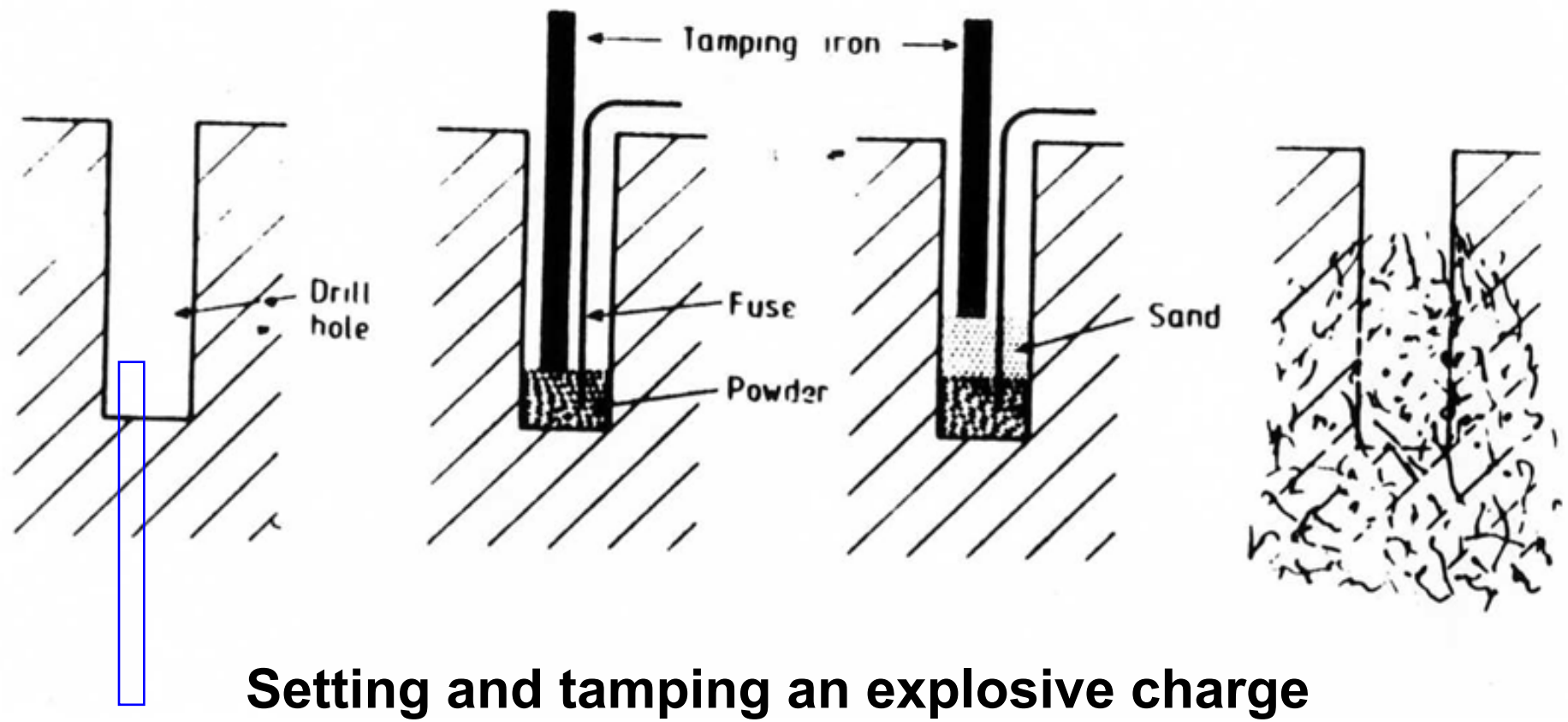
1907

"The famous physiologist, Magendie, preserved with veneration the brain of Laplace. Spurzheim had the very natural wish to see the brain of a great man. To test the science of the phrenologist, Mr. Magendie showed him, instead of the brain of Laplace, that of an imbecile. Spurzheim, who had already worked up his enthusiasm, admired the brain of the imbecile as he would have admired that of Laplace."

Flourens, P. "Psychologie Comparee." (1865).



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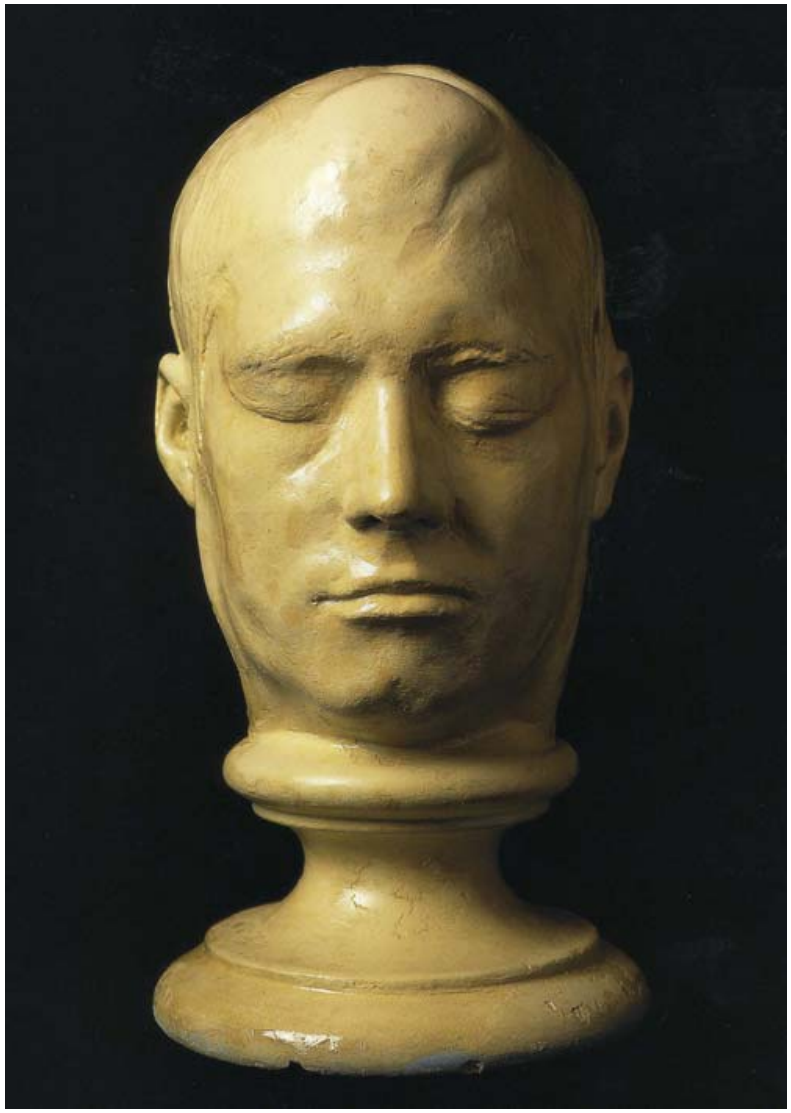
Setting and tamping an explosive charge

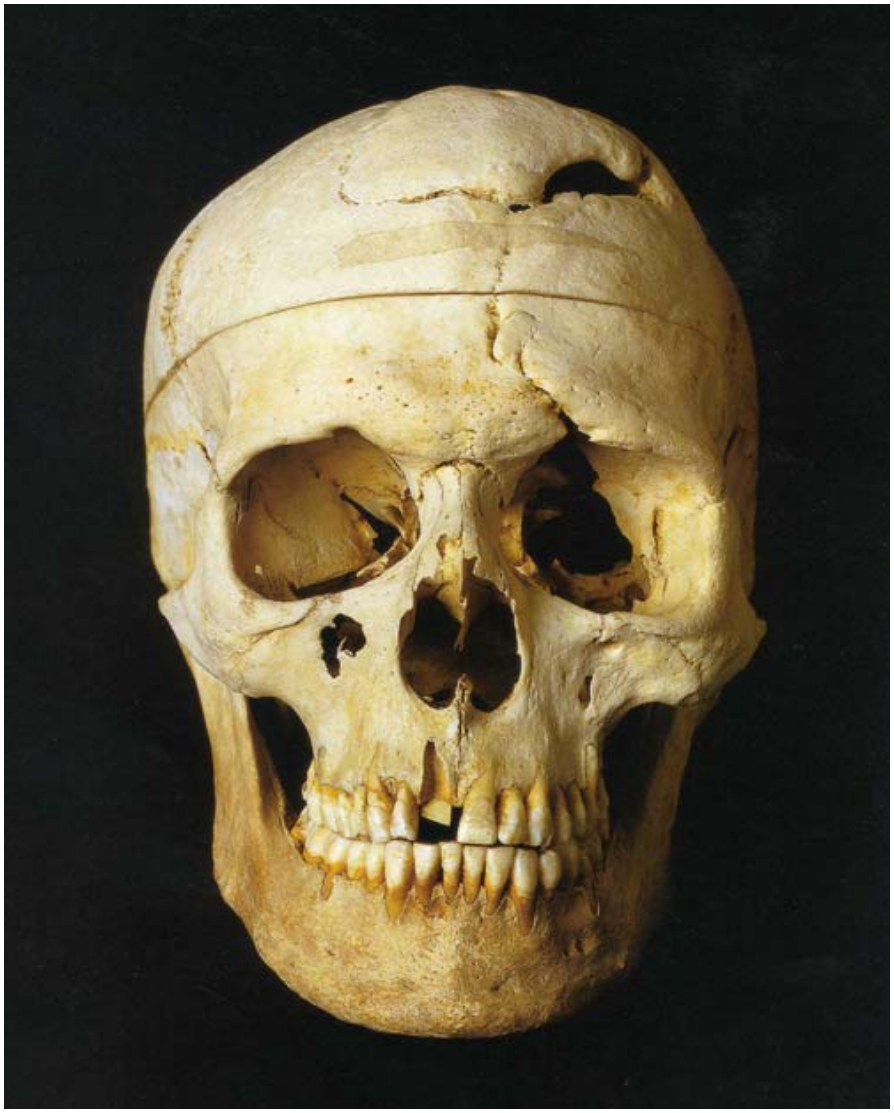
Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.
Source: Macmillan, M. B. "A Wonderful Journey Through Skull and Brains: The Travels of Mr. Gage's Tamping Iron." *Brain and Cognition* 5, no. 1 (1986): 67-107.

Phineas Gage

- age 25 in 1848
- "a well-balanced mind, and was looked upon by those who knew him as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation" (Harlow)
- made a foreman and regarded by his superiors as "the most efficient and capable in their employ"
- September 13, 1848 in Cavendish, VT
- tamping iron - 3 ft 7 in long, 1.25 inches in diameter at larger end, 13.25 pounds
- went through his head, landed 30 yards away
- March, 1849 - back at work. "His contractors... considered the change in his mind so marked that they could not give him his place again"

Phineas Gage





Photos from Fleischman, John. *Phineas Gage: A Gruesome but True Story About Brain Science*. © Houghton Mifflin. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

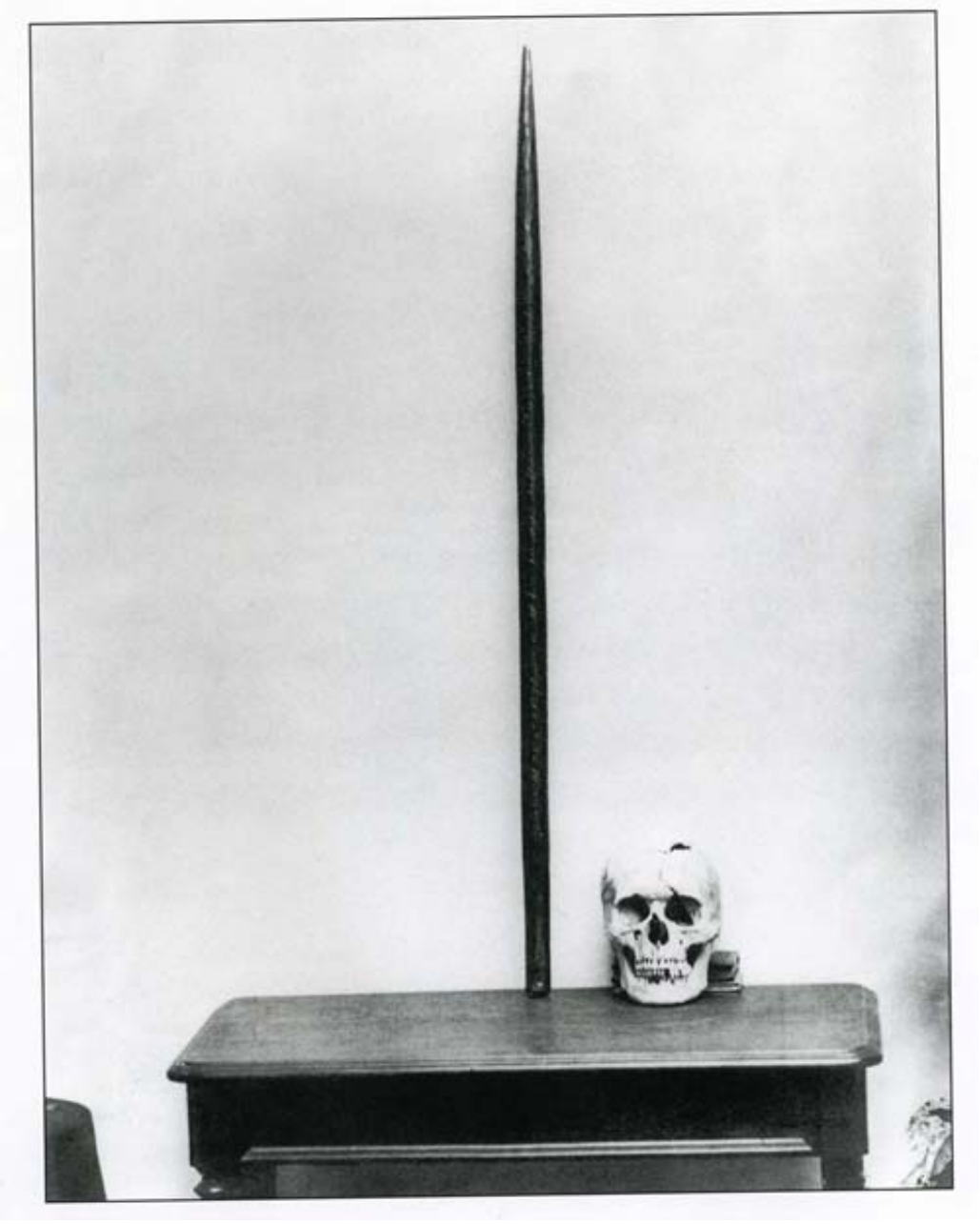
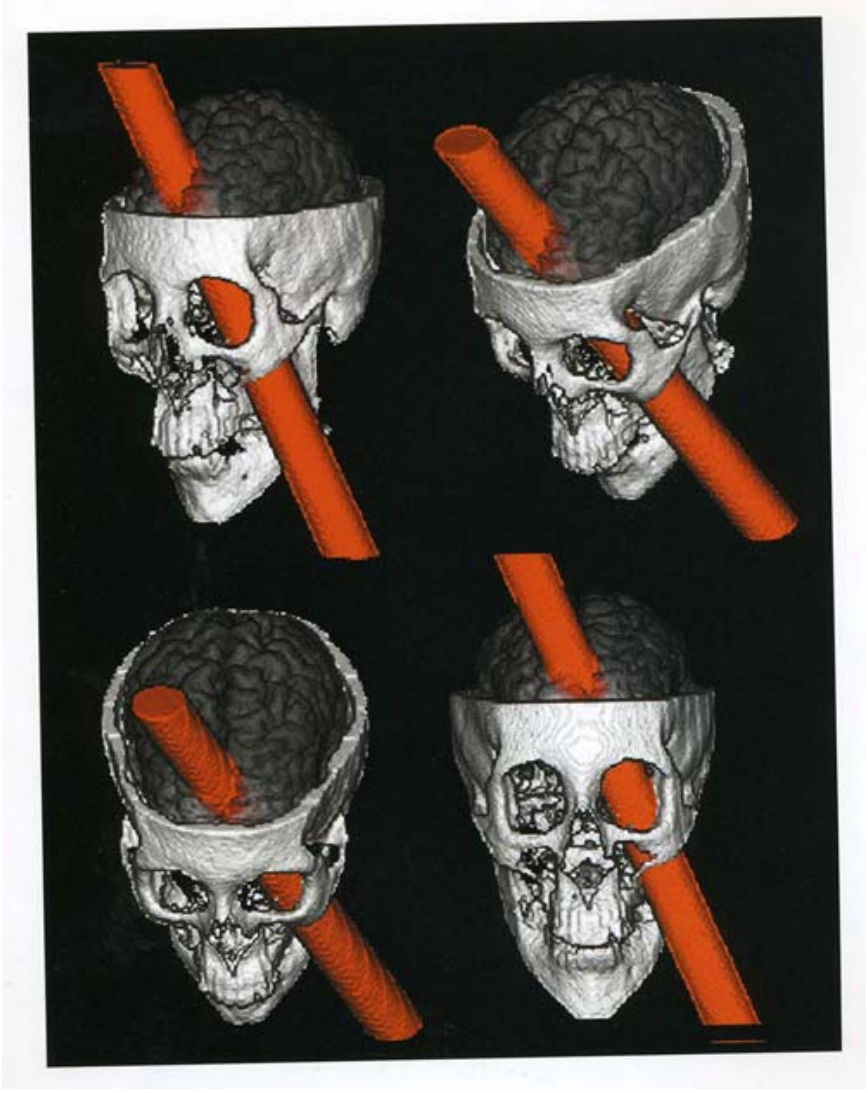


Photo of tamping iron and skull

Public domain image (photo by S. Webster Wyman, 1870).



Computer generated model plotting path of tamping iron (shown in red) through Gage's frontal cortex

Source: Damasio, H., et al. "The Return of Phineas Gage: Clues About the Brain from the Skull of a Famous Patient." *Science* 264, no. 5162 (1994): 1102-5.

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"The equilibrium or balance, so to speak, between his intellectual faculties and his animal propensities, seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operations, which are no sooner arranged than they are abandoned in turn for others appearing more feasible. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man. Previous to his injury, although untrained in the schools, he possessed a well-balanced mind and was looked upon by those who knew him as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation. In this regard, his mind was radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage'." (Harlow, 1868)

Daguerreotype of Phineas Gage

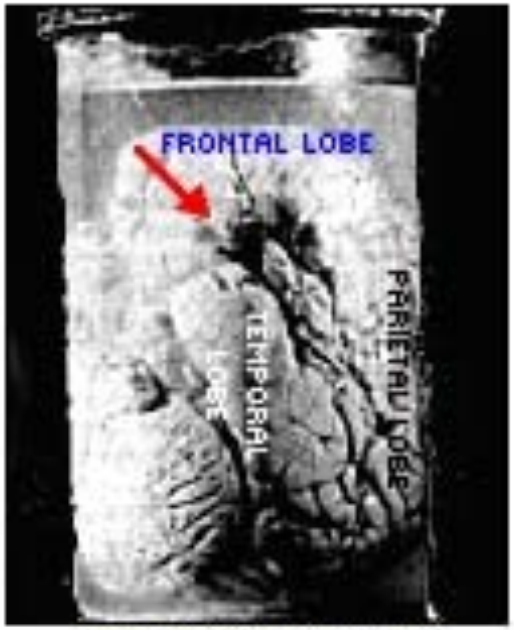


From the collection of Jack and Beverly Wilgus.

Paul Broca
(1824-1880)



PAUL BROCA



THE BRAIN OF MR. 'TAN'

Right photo (Mr. Tan's brain) © source unknown. All rights reserved.
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- **Jean Baptiste Bouillaud (1796-1881) argued for left-sided control of speech in 1825**
- **Marc Dax in 1836 reported that in a series of cases disorders of speech followed left hemisphere lesions - published by his son in 1865**
- **Ernest Auburtin (Bouillaud's son-in-law) reported to the Anthropological Society of Paris in 1861 a case "who had lost his speech but understood everything said to him . . . his intelligence is still unimpaired, and speech is wholly abolished... based on the symptoms that he presents, we have diagnosed softening of the anterior lobes"**

- **Paul Broca (1824-1880) heard speech**
- **5 days later received a patient, LeBorgne, who had lost his speech, could only say "tan" and utter an oath - right-sided paralysis - otherwise apparently normal**
- **Tan died on April 17, 1861 and the next day Broca reported to the Anthropological Society of Paris left anterior focus of Tan's lesion - by 1863 8 more cases. "in which the lesion was in the posterior third of the third frontal convolution. This number seems to me to be sufficient to give strong presumptions. And the most remarkable thing is that in all the patients the lesion was on the left side. I do not dare draw conclusions from this. I await new facts."**
- **Broca's aphasia - inability to speak despite presence of intact vocal mechanisms and normal comprehension**

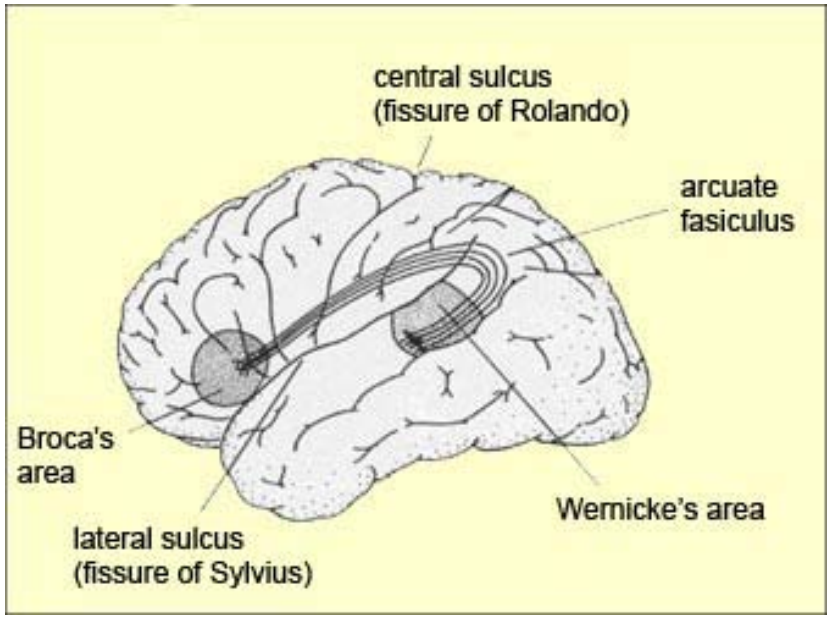


Diagram courtesy of Bruno Dubuc, from The Brain from Top to Bottom.



Reprinted by permission from Macmillan Publishers Ltd: Nature Reviews Neuroscience. Source: Rorden, Chris and Hans-Otto Karnath. "Using Human Brain Lesions to Infer Function: A Relic from a Past Era in the fMRI Age?" *Nature Reviews Neuroscience* 5 (2004): 812-19. © 2004.

Broca's Area:

- **language processing**
- **speech production and comprehension**

Broca's aphasia:

- **results from damage to Broca's Area (e.g., lesions)**
- **unable to create grammatically-complex sentences**
- **speech described as telegraphic, contains content words only**
- **comprehension is relatively normal**

WADA TEST FOR LANGUAGE LATERALIZATION

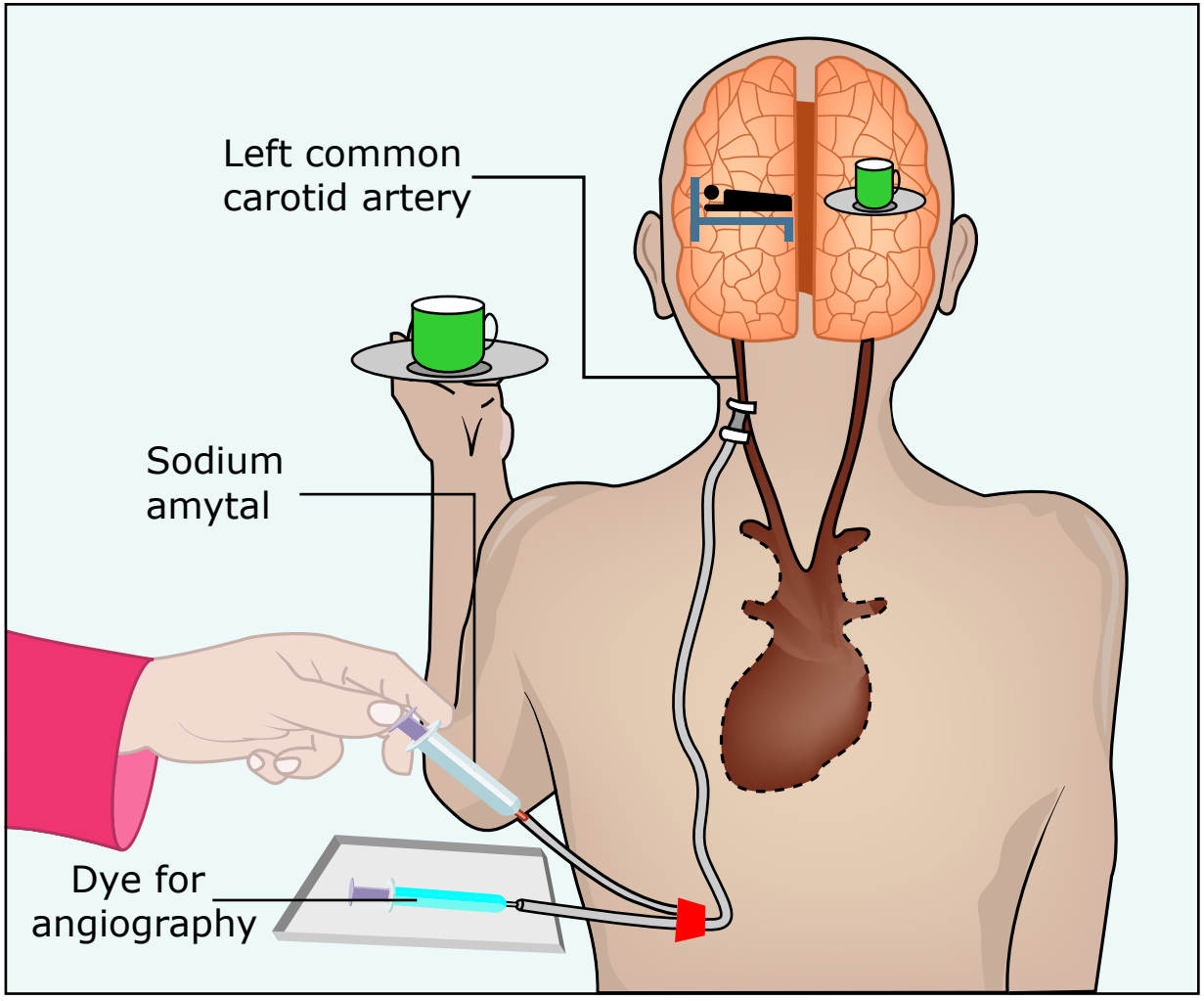
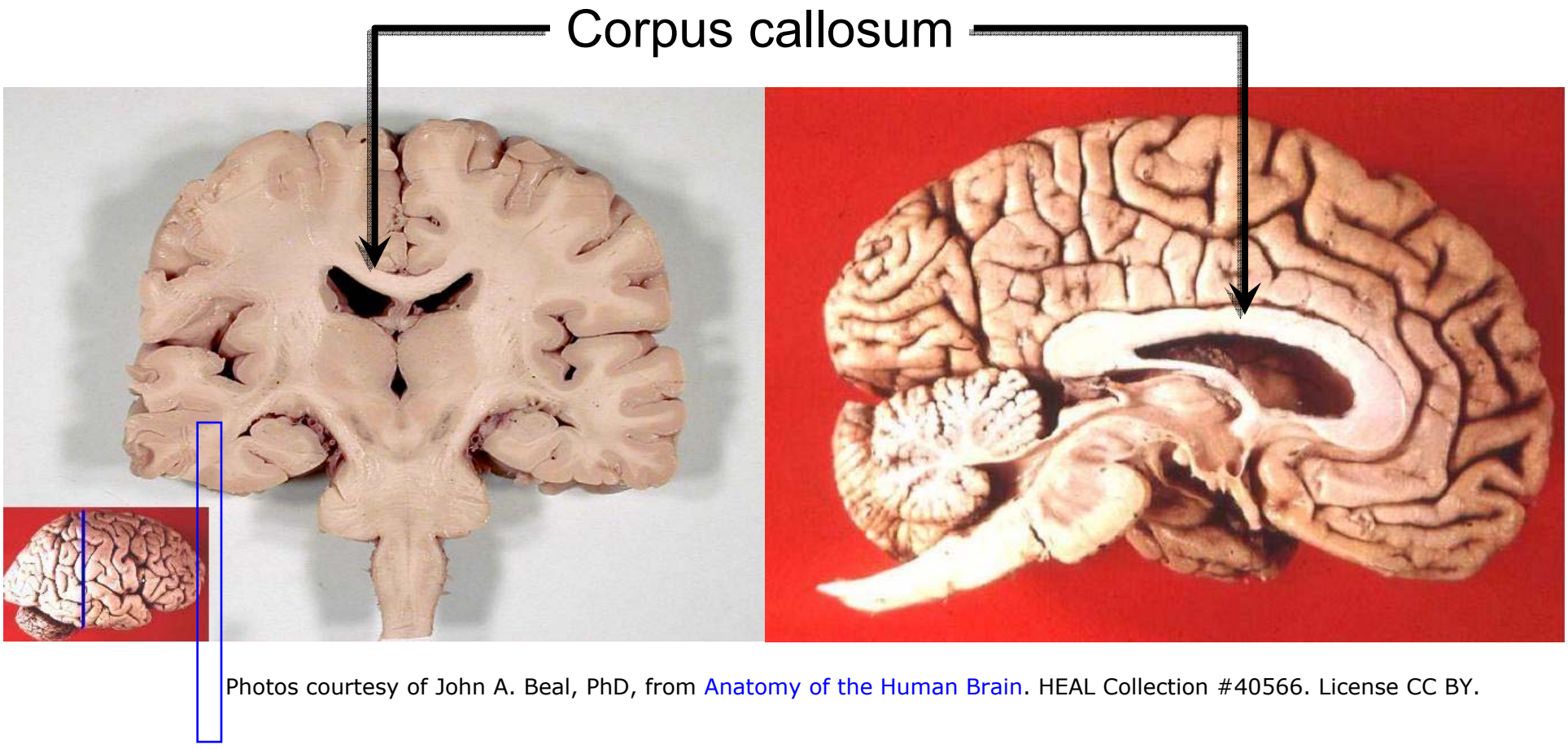


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Corpus Callosum



Photos courtesy of John A. Beal, PhD, from Anatomy of the Human Brain. HEAL Collection #40566. License CC BY.

Mystery of the corpus callosum

1. Gustav Fechner - 19th century - would a divided brain lead to separate stores of mood, predisposition, knowledge, memory?
2. William McDougall - a founder of British Psychological Society - unity of consciousness does not depend upon continuity of nervous system - volunteered for commissurotomy if he got incurable disease
3. Erickson - 1940 - spread of epileptic discharge from hemisphere to hemisphere by corpus callosum
4. 1957

 - "corpus callosum is hardly connected with psychological functions at all... it is for transmitting seizure activity from one hemisphere to the other" (Warren McCullough)

 - "to keep hemispheres from collapsing into one another" (Karl Lashley)

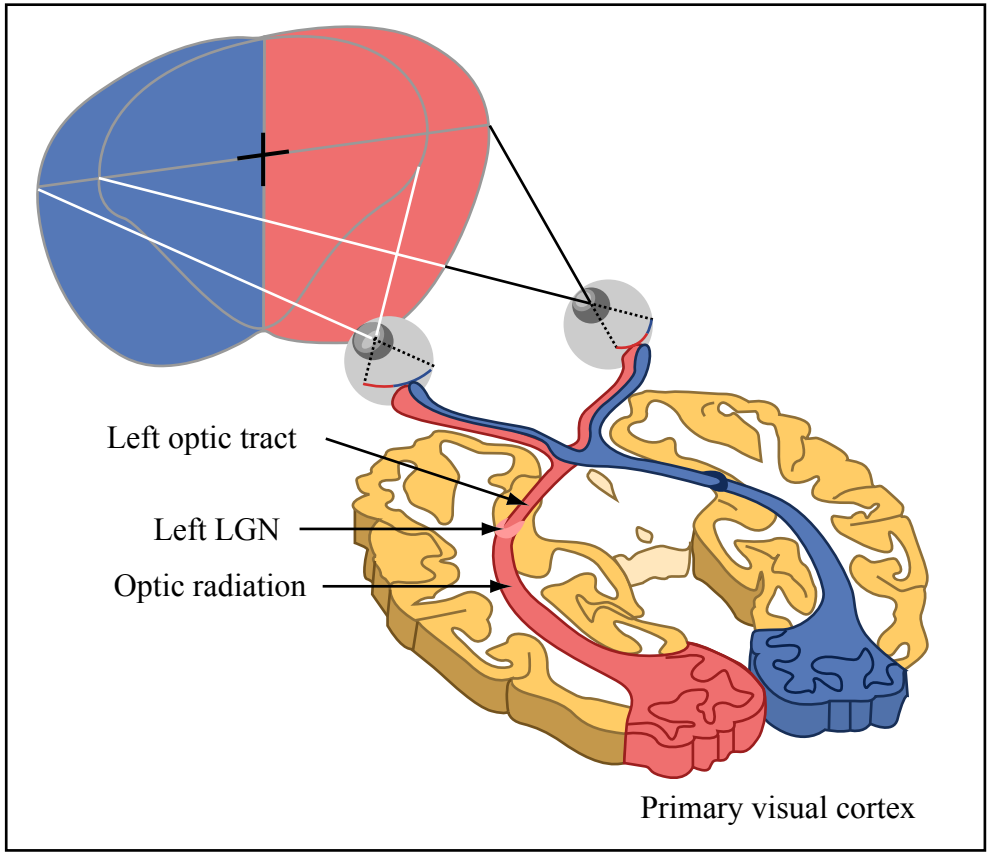
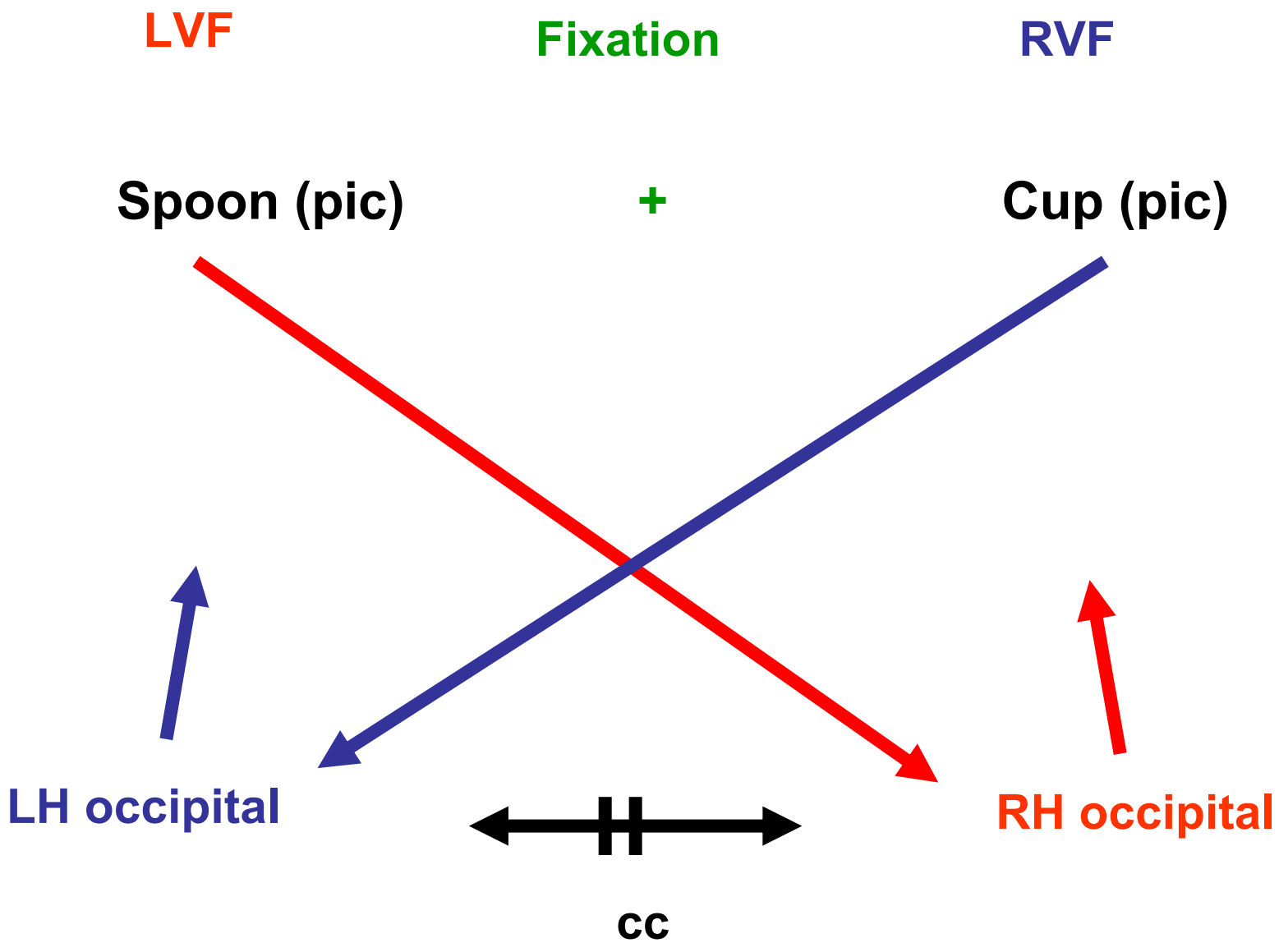
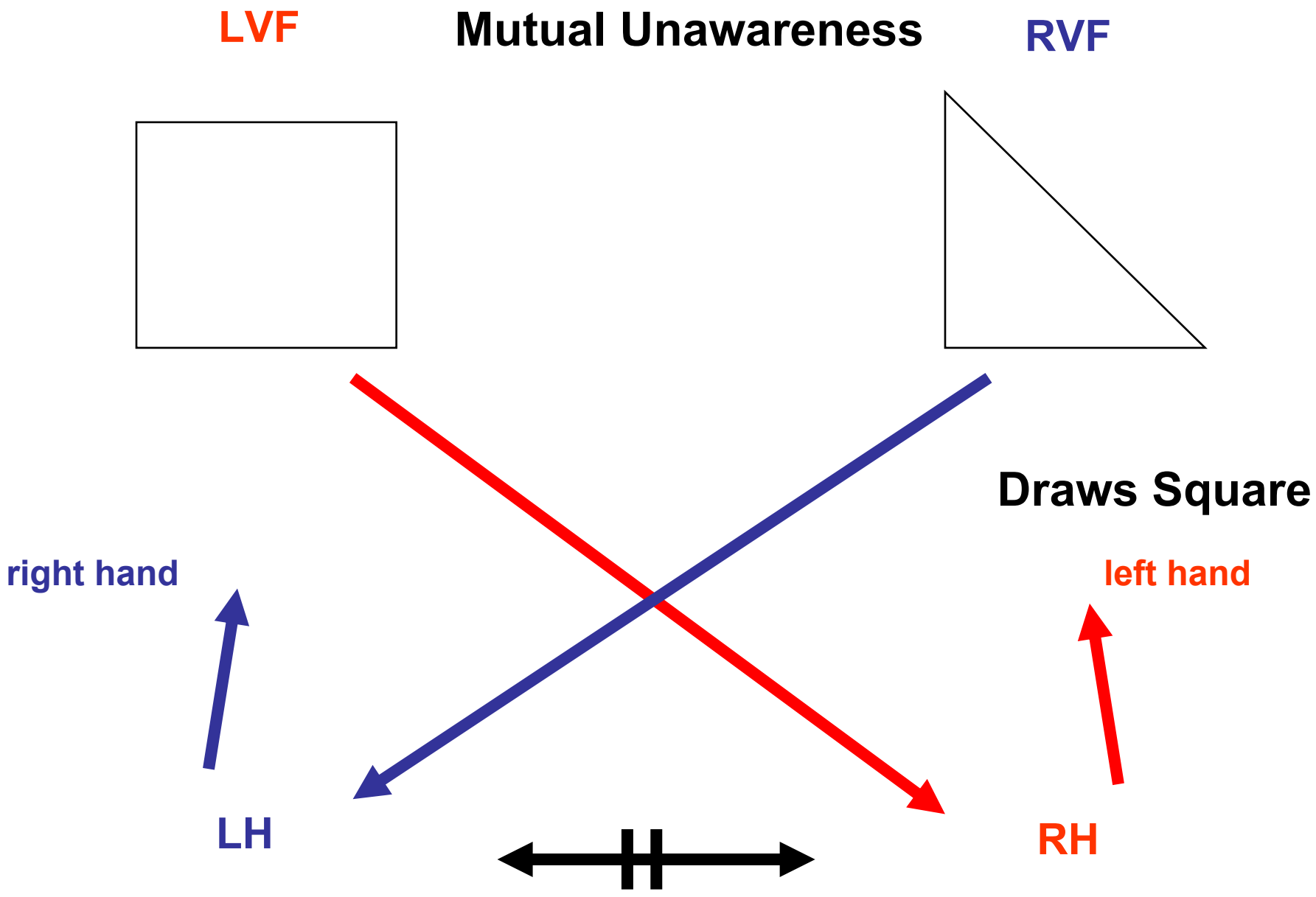


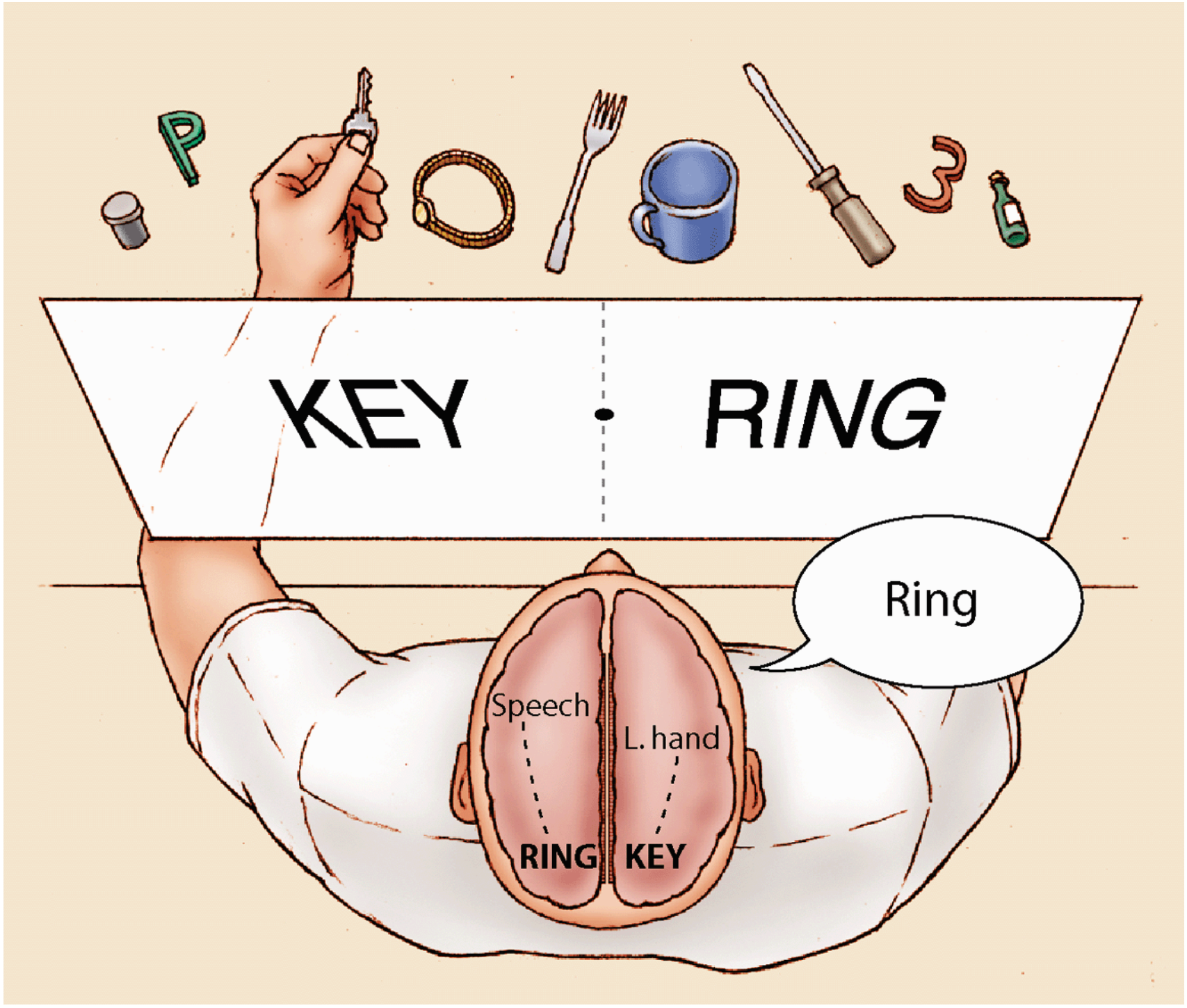
Image by MIT OpenCourseWare. After Figure 10-4b in Bear, Mark F., Barry W. Connors, and Michael A. Paradiso. *Neuroscience: Exploring the Brain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins, 2007. ISBN: 9780781760034.



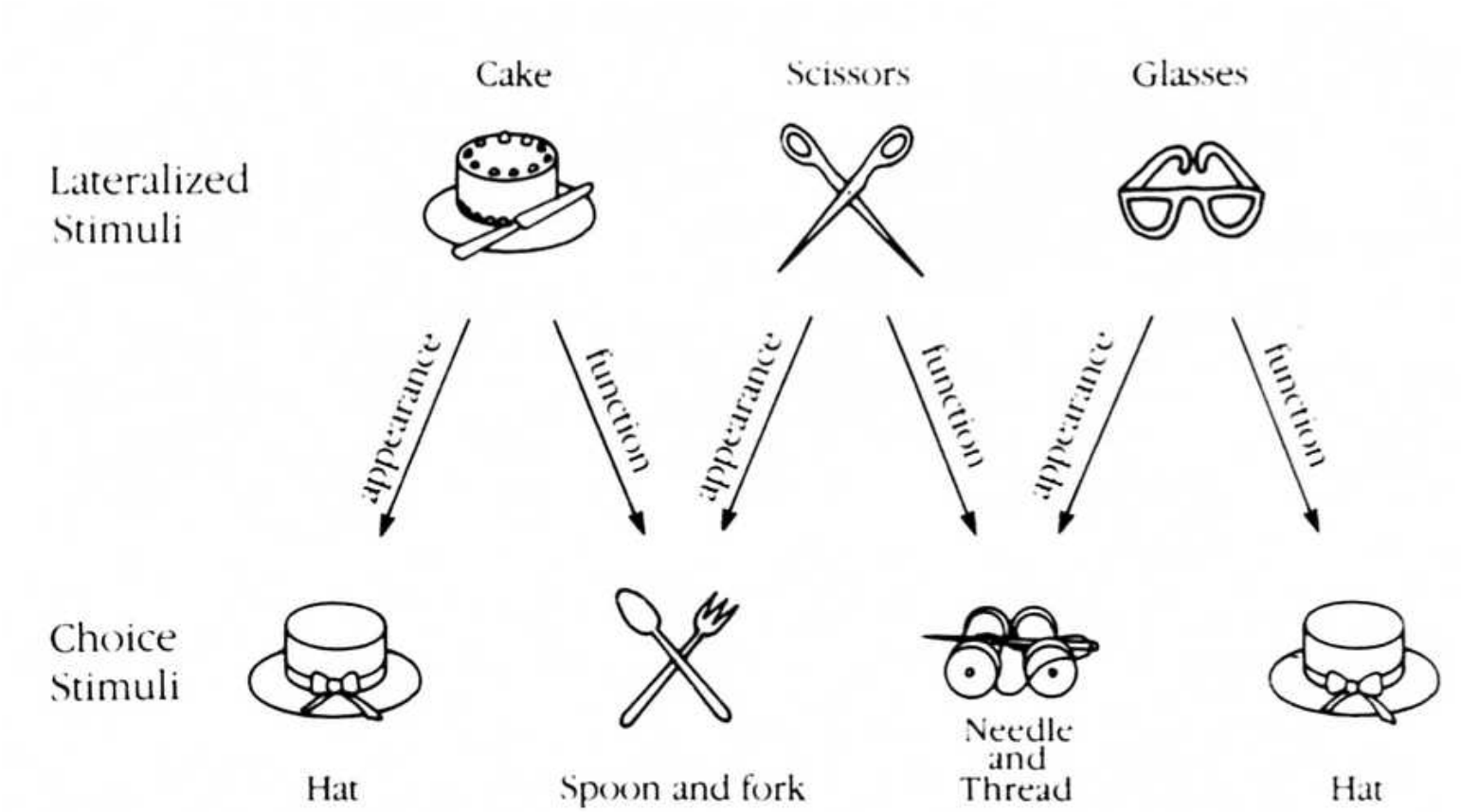
What did you see? CUP



What did you see? - Triangle



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Function and appearance matches by split-brain patients

Source: Levy, J., and C. Trevarthen. *Journal of Experimental Psychology: Human Perception and Performance* 2 (1976): 299-312. Courtesy of the American Psychological Association.

PROTOTYPICAL CALLOSOTOMY RESULTS

1. patient fixates centrally
 picture of cup in RVF - says "cup" –
 picture of spoon in LVF - reports seeing nothing –
 picks spoon with left hand - what was it? "pencil"
 speech production from LH only in most patients
 some language comprehension in RH
2. mutual unawareness - modularity
 present square to LVF, triangle to RVF -
 draw with unseen left hand - draws a square -
 what did you see? "a triangle"
3. somesthesis
 no cross retrieval of objects
 no cross replication of hand postures
 no cross localization of fingertips
4. different modes of information processing of the same stimulus in the two hemispheres
 - LH matched by function
 - RH matched by appearance
 - LH analyzes local elements
 - RH analyses global elements

PROTOTYPICAL CALLOSOTOMY RESULTS (cont'd)

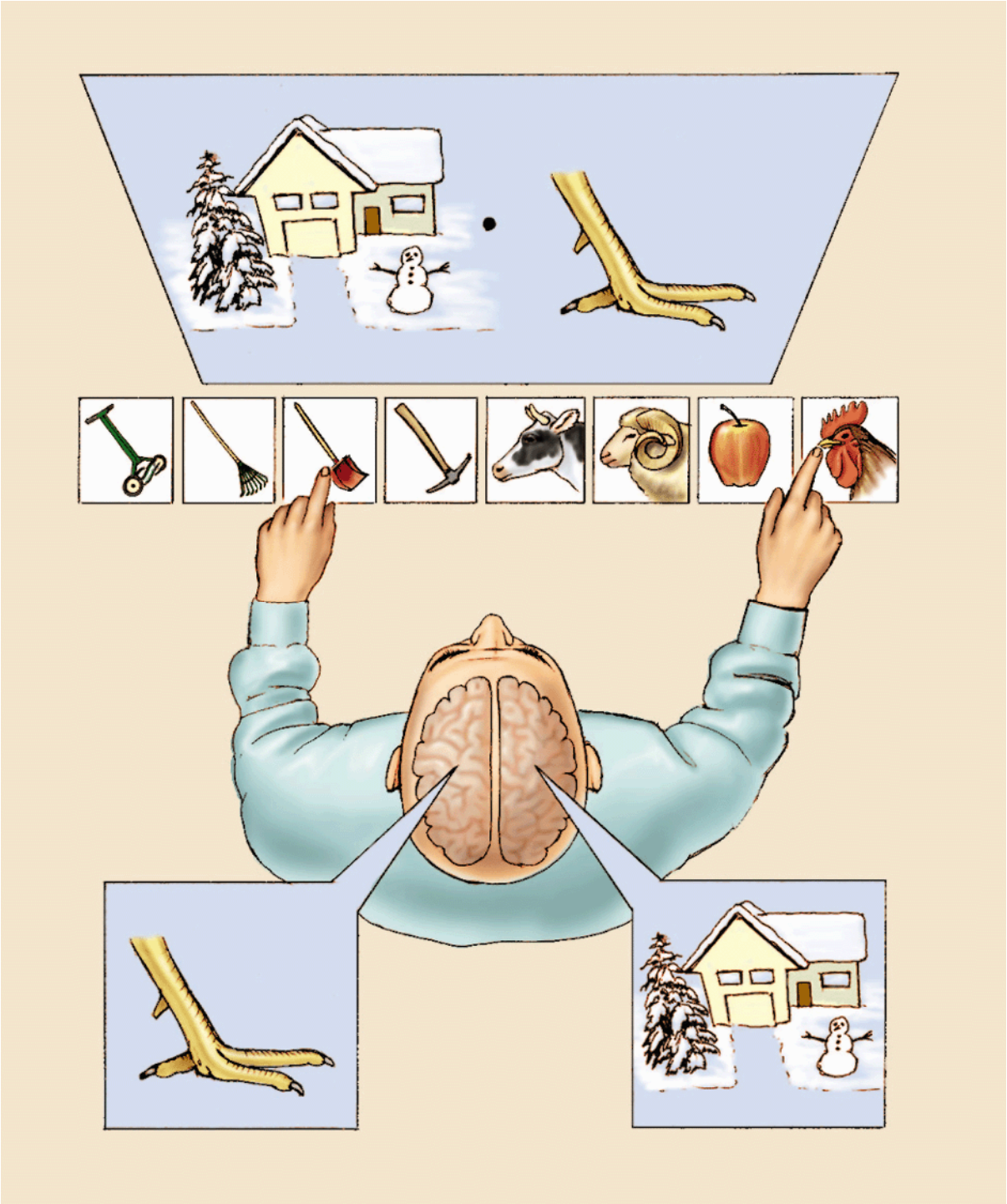
5. unity of consciousness usually good in daily life
 - picture of nude woman in LVF - patient blushes, giggles - why laughing? "Oh doctor, you have some machine!" -

 some exceptions - one hand pulling up pants and the other pulling down - angry at wife, one hand forcibly reaching for her, right hand grabbed left to stop it - another patient "I open the closet. I know what I want to wear. As I reach for something with my right hand, my left comes up and takes something different. I can't put it down if it's in my left hand. I have to call my daughter." - another patient working in father's grocery store would stock something into shelf with one hand and remove it with the other

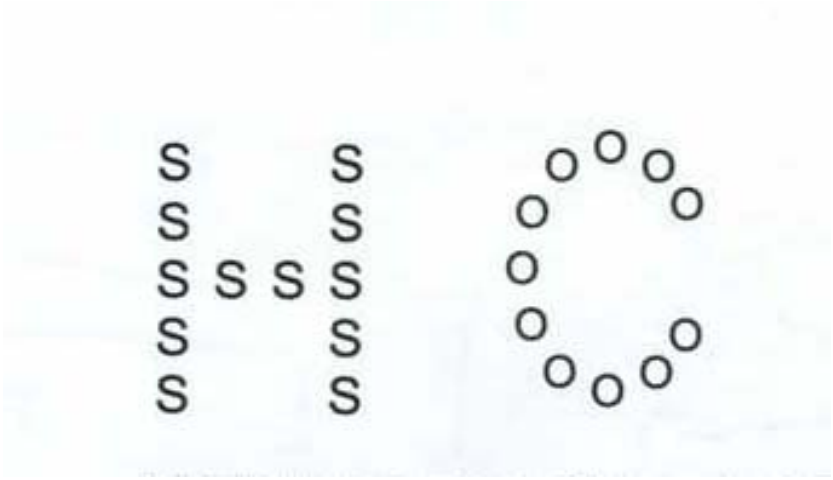
 present "walk across room" in LVF - subject gets up, walks across room - "why did you walk across room?" - "I was thirsty"

PS - pairs of pictures in VFs - pick 2/8 in free vision that are related to presented pictures - sees claw in RVF, snow scene in LVF - rh points to chicken, lh to shovel - "I saw a claw and I picked the chicken, and you have to clean out the chicken shed with a shovel."

"I saw a claw and I picked the chicken, and you have to clean out the chicken shed with a shovel."



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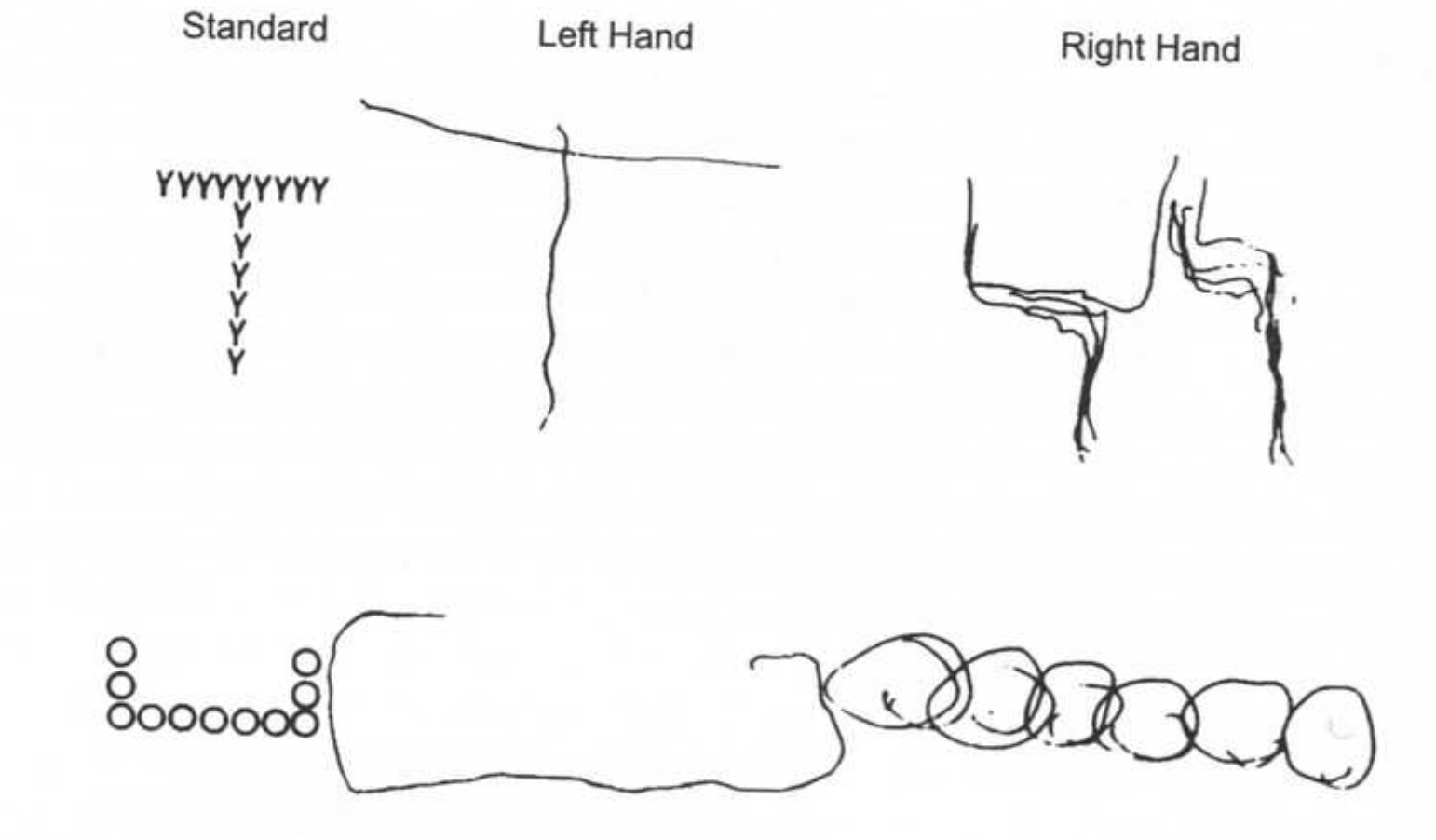




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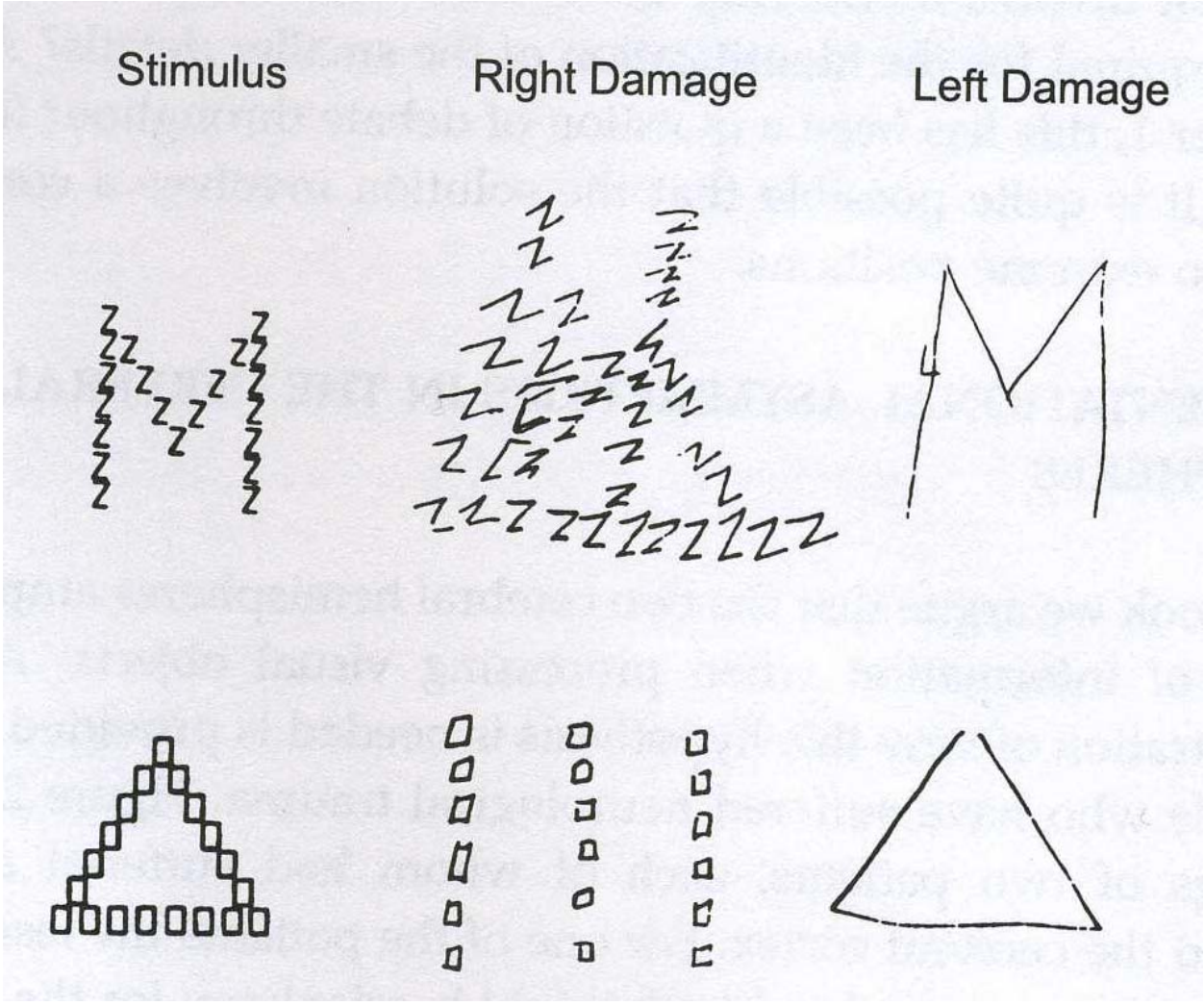
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Split-Brain Patient After Surgery

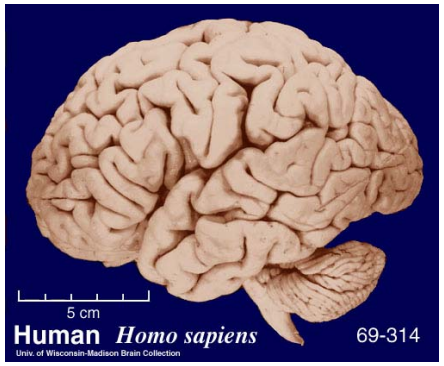


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After Stroke



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Human Brain

- neurons
- gross anatomy

Localization of mental functions in human brain

- phrenology
- Phineas Gage, moral behavior, orbitofrontal cortex
- Broca, Tan, and left lateralization of language

Hemispheric Specialization - parallel processing

- appearance (right) vs. function (left)
- global (right) vs. local (left)

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The Human Brain

HOW DO WE LEARN ABOUT THE HUMAN BRAIN?

Methods of Studying the Human Brain



Courtesy of University of Oregon Child and Family Center.



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Methods of Studying the Human Brain

- **Lesions**
- **Stimulation**
- **Recording**

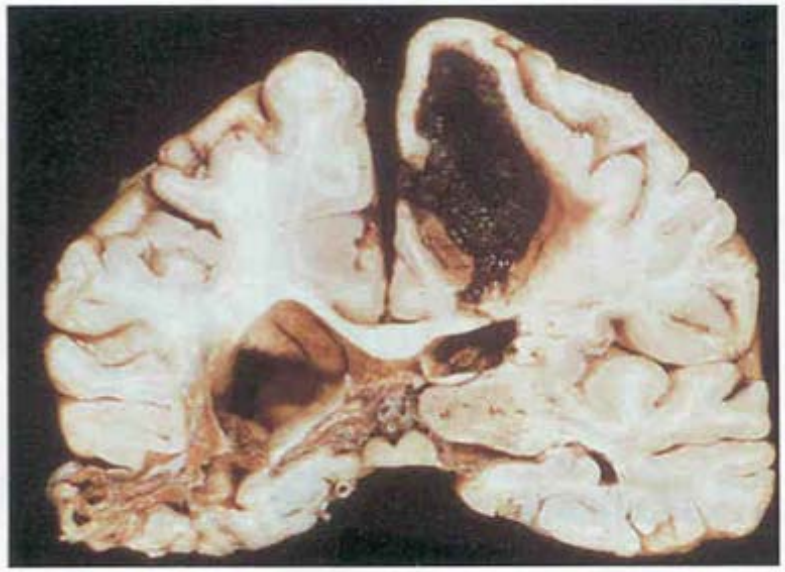
OUTLINE

1) **Lesion**
2) **Stimulation**
3) **Recording**
 - **a. Structure**
 - **b. Function**
 - **i. Electrical/Magnetic**
 - **- EEG**
 - **- MEG**
 - **ii. Metabolic**
 - **- PET**
 - **- fMRI**

Goals: • ***introduce techniques***
• ***present strengths and limitations***

STROKE





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LESIONS

Causes of Brain Injury

stroke (CVA) : blood flow is disrupted

hypoxia : lack of oxygen

tumors : abnormal cell growth

degenerative disorders : Alzheimer's, Huntington's, Parkinson's, Korsakoff's

epilepsy : resection



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NEURONAL DEATH

LESIONS

Strengths

- **Causal - brain area necessary**
- **Dramatic deficits: Phineas Gage, Tan, H.M., prosopagnosia**
- **Counterintuitive deficits: Blindsight, Category-Specific Deficits**
- **Dissociations**

 declarative memory (knowing that) & hippocampus
 procedural memory (knowing how) & basal ganglia

LESIONS

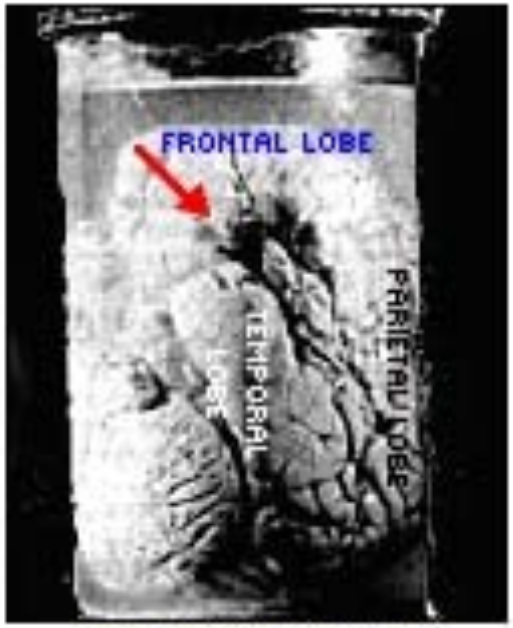
Limitations

- damage extensive, hard to localize, not systematic
- individual variability:
 - case v.s. groups studies
- nearby systems likely to get injured together
- degeneration, recovery, compensation
- may offer limited views of normal brain functions

Paul Broca (1824-1880)



PAUL BROCA



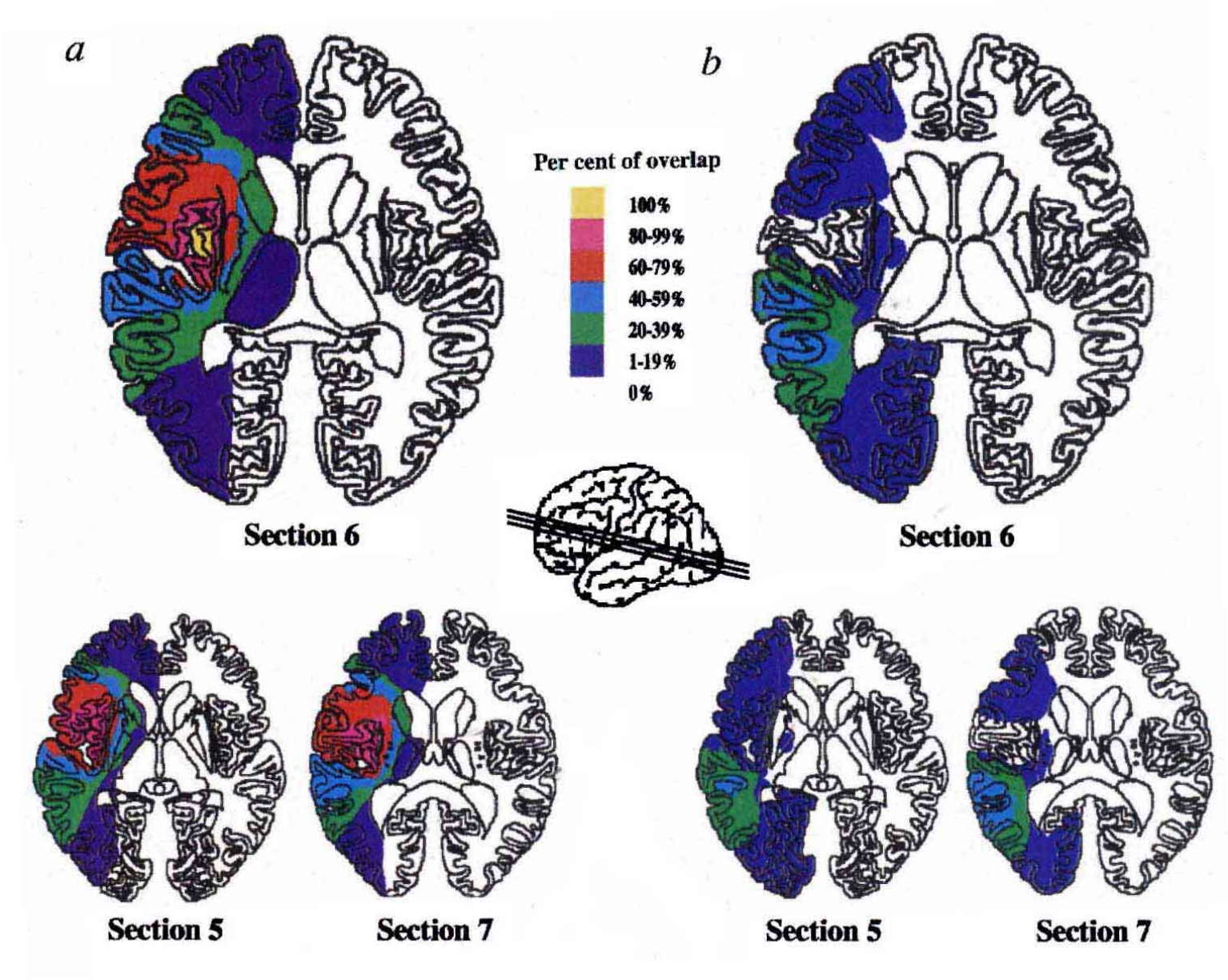
THE BRAIN OF MR. 'TAN'

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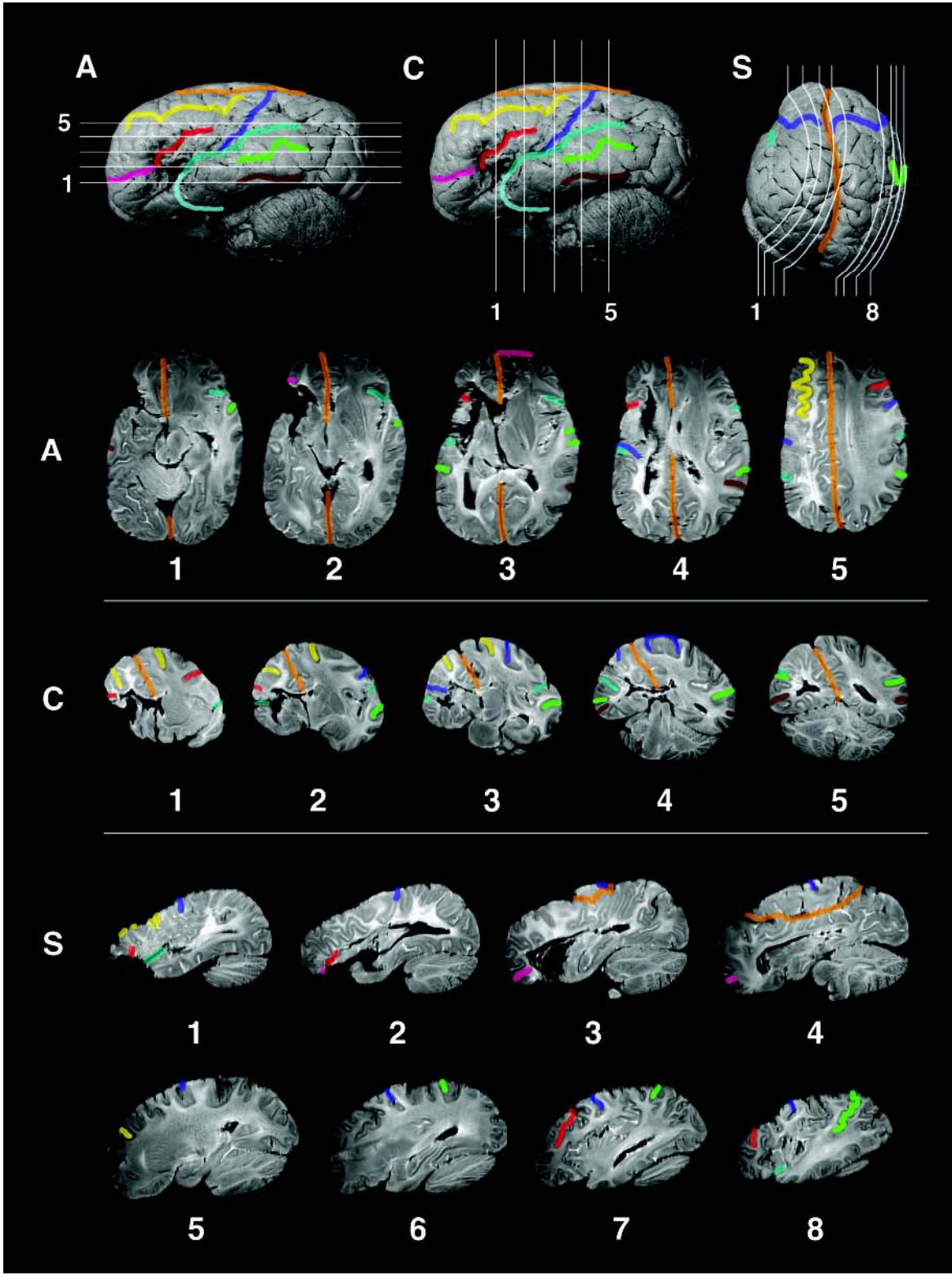
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“Broca’s Area”: Left Precentral Gyrus of Insula



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High-Resolution MRI of Leborgne/Tan reveals extensive medial damage including arcuate/ superior longitudinal fasciculus



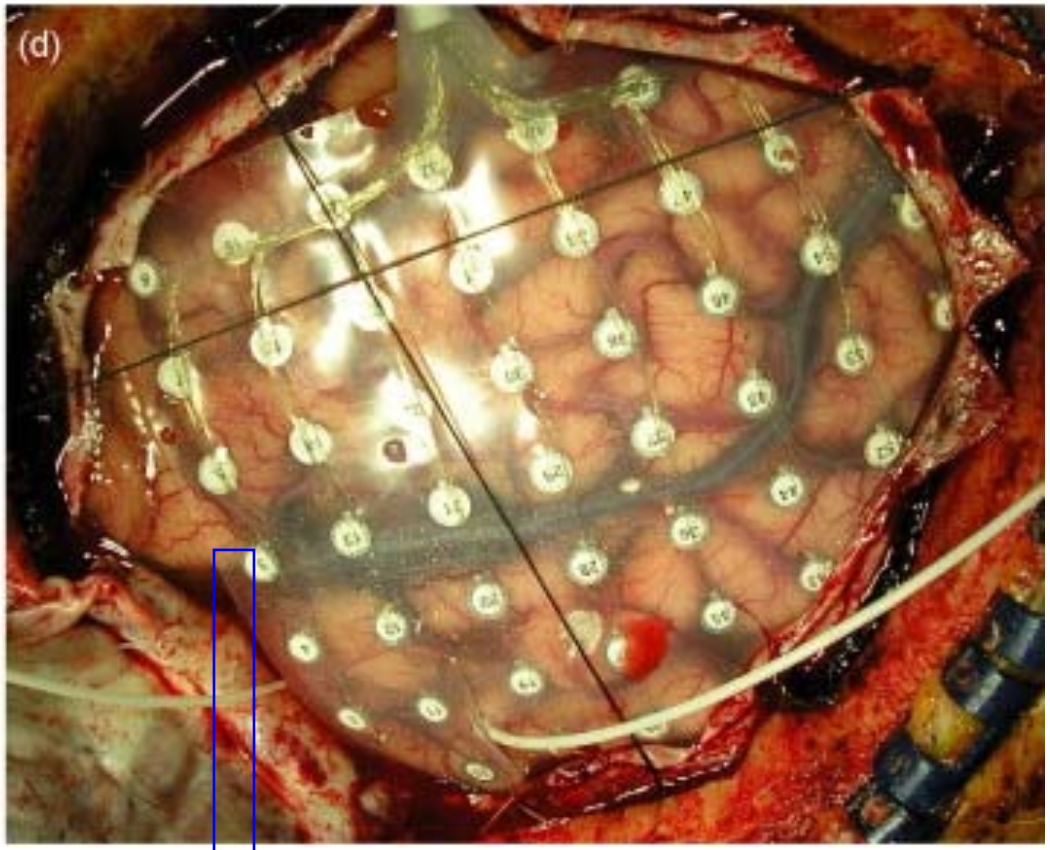
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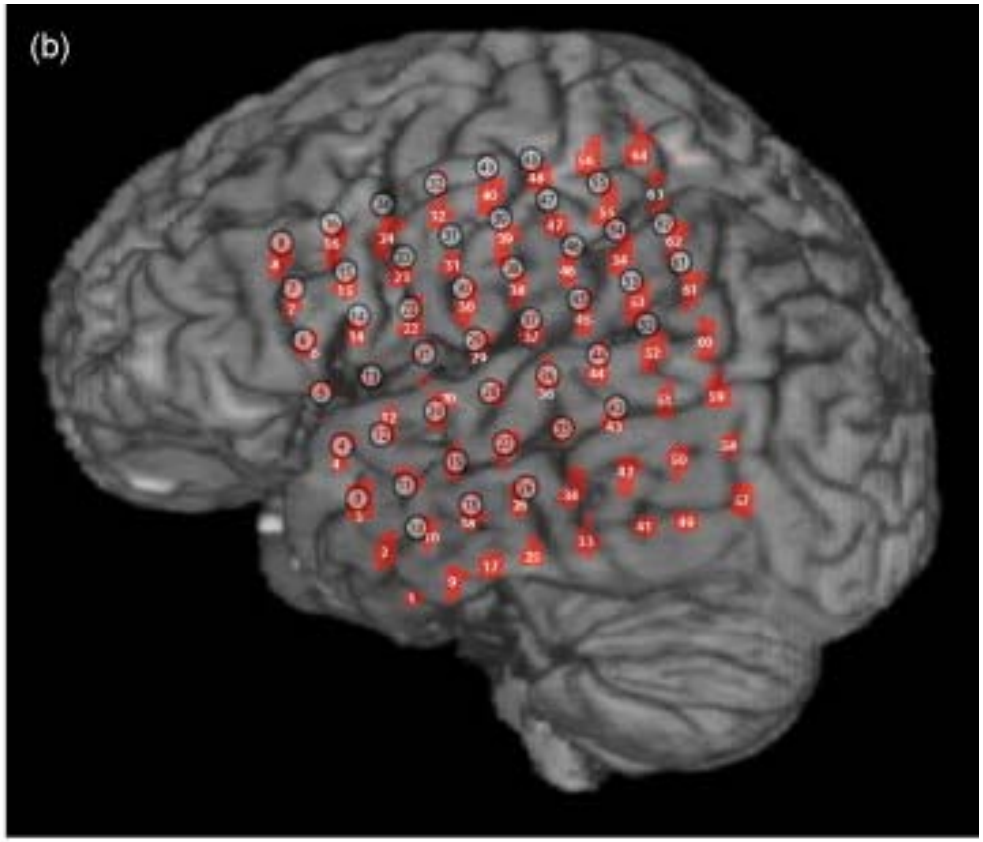
OUTLINE

1) Lesion
2) Stimulation
3) Recording
 - a. Structure
 - b. Function
 - i. Electrical/Magnetic
 - EEG
 - MEG
 - ii. Metabolic
 - PET
 - fMRI

Goals:
- *introduce techniques*
- *present strengths and limitations*

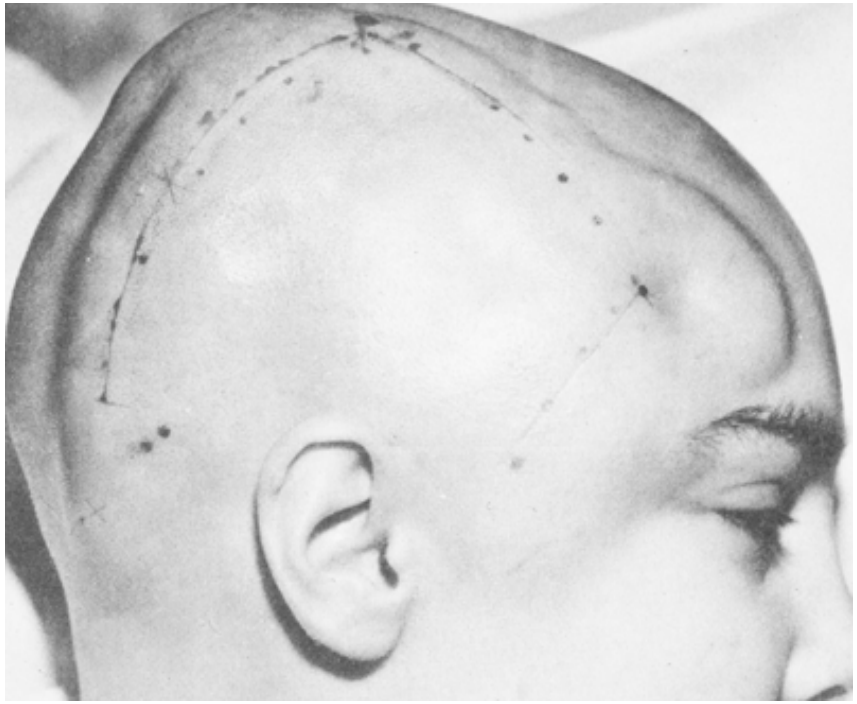
Stimulation

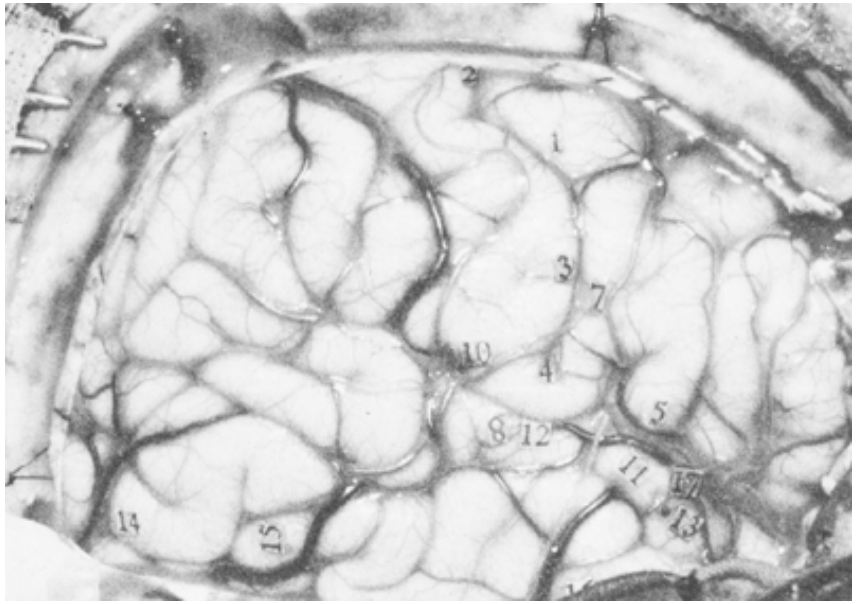




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Source: Dalal, S. S., et al. *J Neurosci Methods* 174, no. 1 (2008): 106-15.

Electrical stimulation





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Pioneered by Penfield (1940s) while treating epilepsy patients

- Limited use

STIMULATION

Transcranial Magnetic Stimulation - TMS

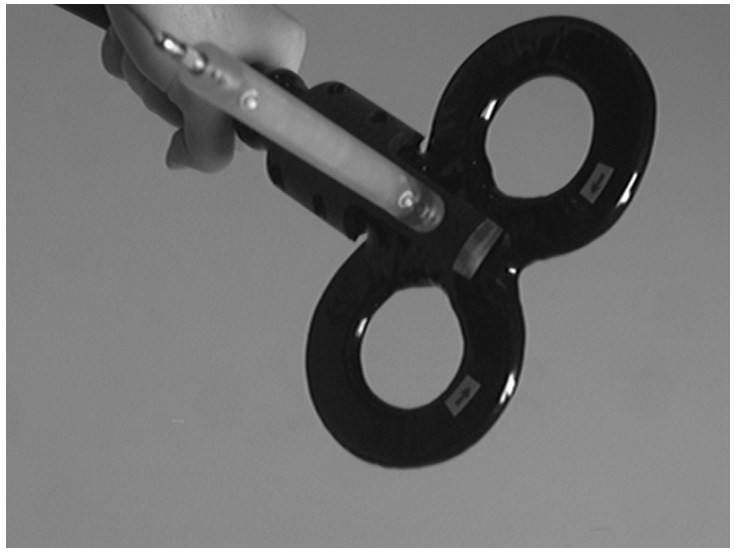
- disrupts neural function

- figure-8 wire coil

- generation of magnetic field

- passes through skull; induces current; neurons fire

- spatial resolution: 1.0-1.5 cm^2





- sensation of scalp being withdrawn up, loud click, muscle twitches

- interferes with sensations

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STIMULATION

Uses of TMS

- Motor Mapping

- Suppress neural activity

 - Low-frequency stim (<1 Hz)

- Enhance neural activity

 - High-frequency stim (>1 Hz)

 - i.e., faster picture naming with temporal lobe stimulation

- Possible TX of neuropsychiatric disorders

 - low-freq stim in auditory cortex of SZs decreases auditory hallucinations

STIMULATION

TMS - strengths & limitations

Strengths

- non-invasive

- directly assesses ± critical regions (causal)

Limitations

- spread of activation

- mild headache

- can only go 2cm below the scalp (due to weakening of magnetic field)

OUTLINE

1) Lesion
2) Stimulation
3) Recording

a. Structure

b. Function

i. Electrical/Magnetic
 - EEG
 - MEG

ii. Metabolic
 - PET
 - fMRI

Goals:
- *introduce techniques*
- *present strengths and limitations*

RECORDING

Structure vs. Function

Structure (anatomy)

- only images anatomy
- angiography, CT, MR
- diffusion tensor imaging (DTI)

Function (physiology)

- investigates brain activity during cognitive processes
- electrical: single-cell, multi-electrode, EEG, MEG
- metabolic: PET, fMRI

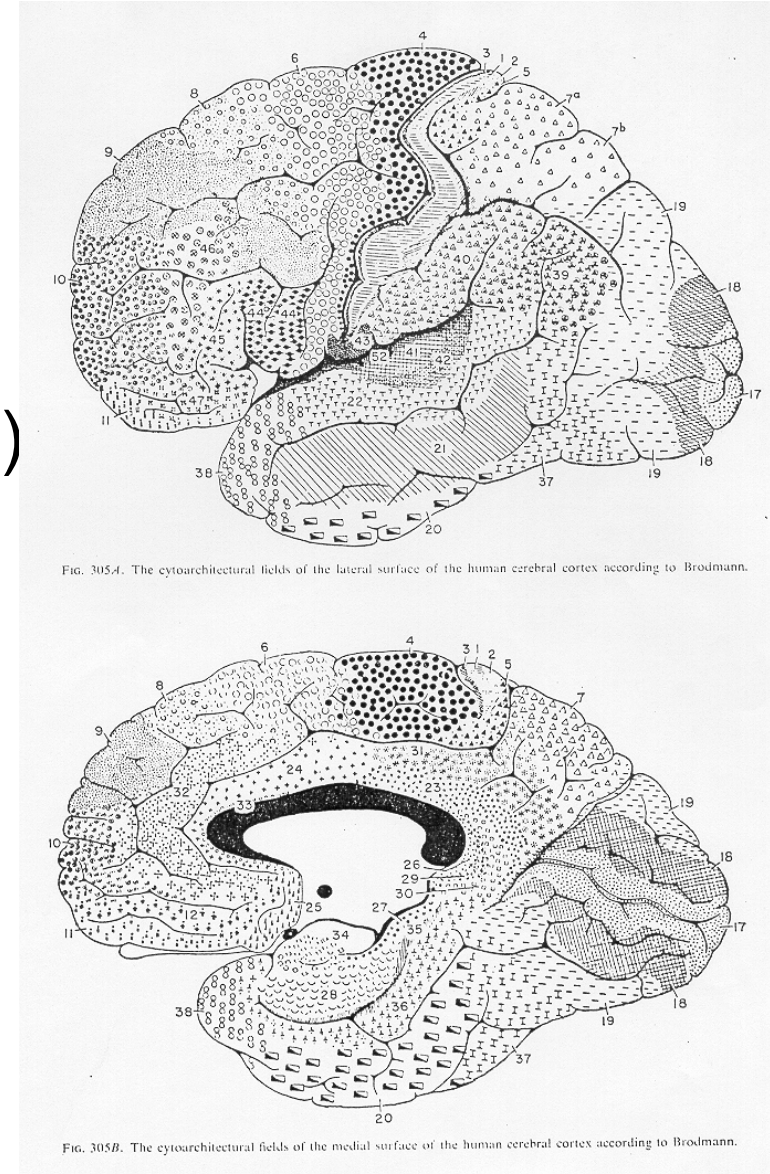
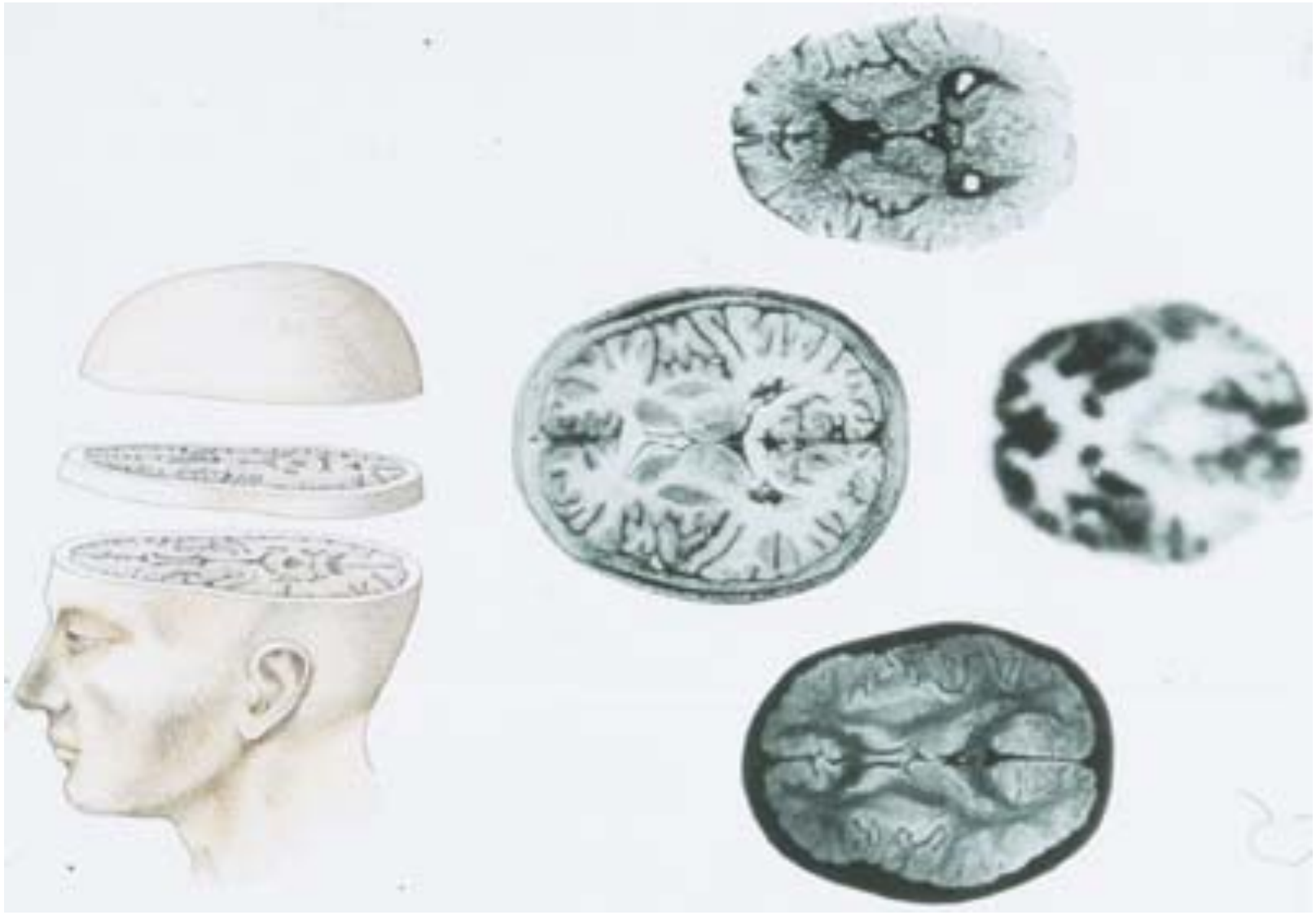


FIG. 305*A*. The cytoarchitectural fields of the lateral surface of the human cerebral cortex according to Brodmann.

FIG. 305*B*. The cytoarchitectural fields of the medial surface of the human cerebral cortex according to Brodmann.

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Anatomical Images



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RECORDING

Structure - MRI

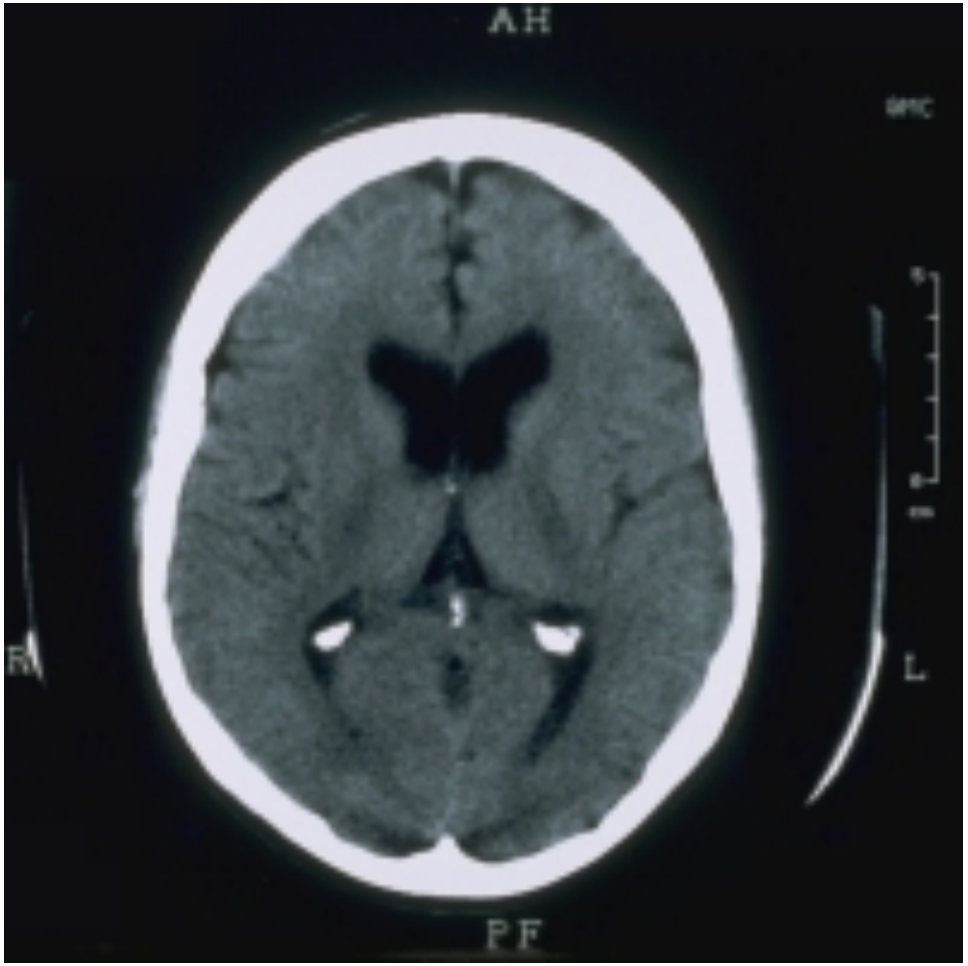
Magnetic Resonance Imaging



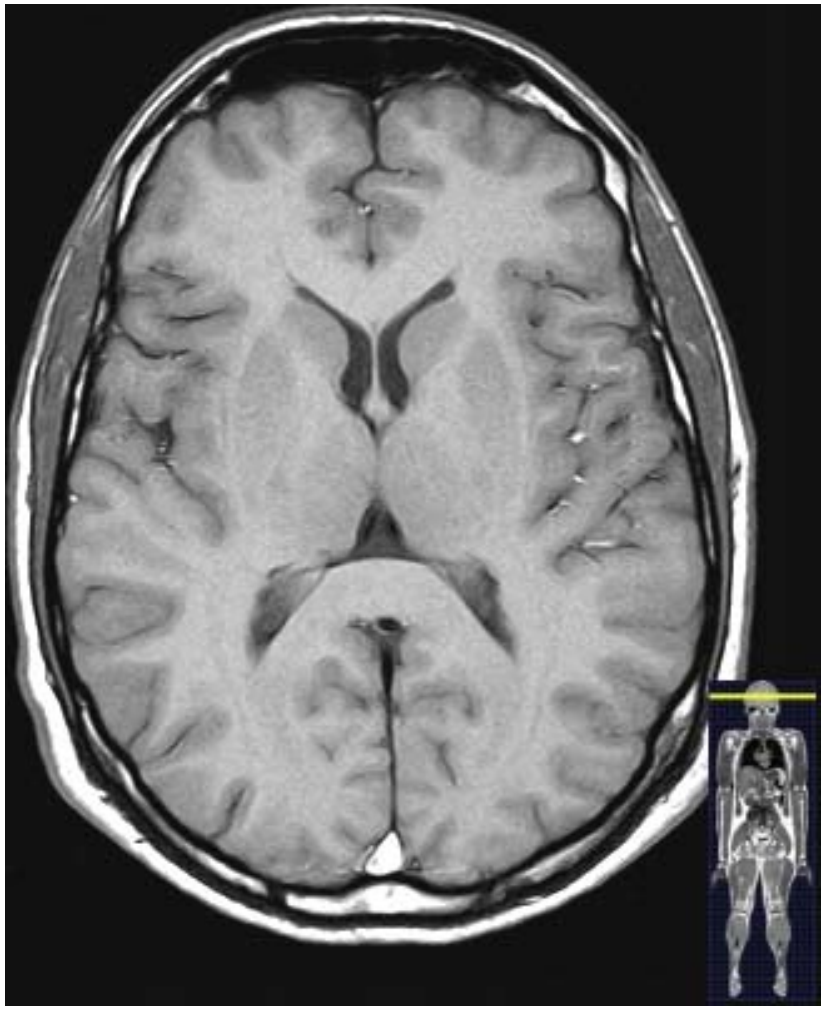
RECORDING

Structure - MRI resolution

- clear distinction btw white and gray matter; great spatial resolution



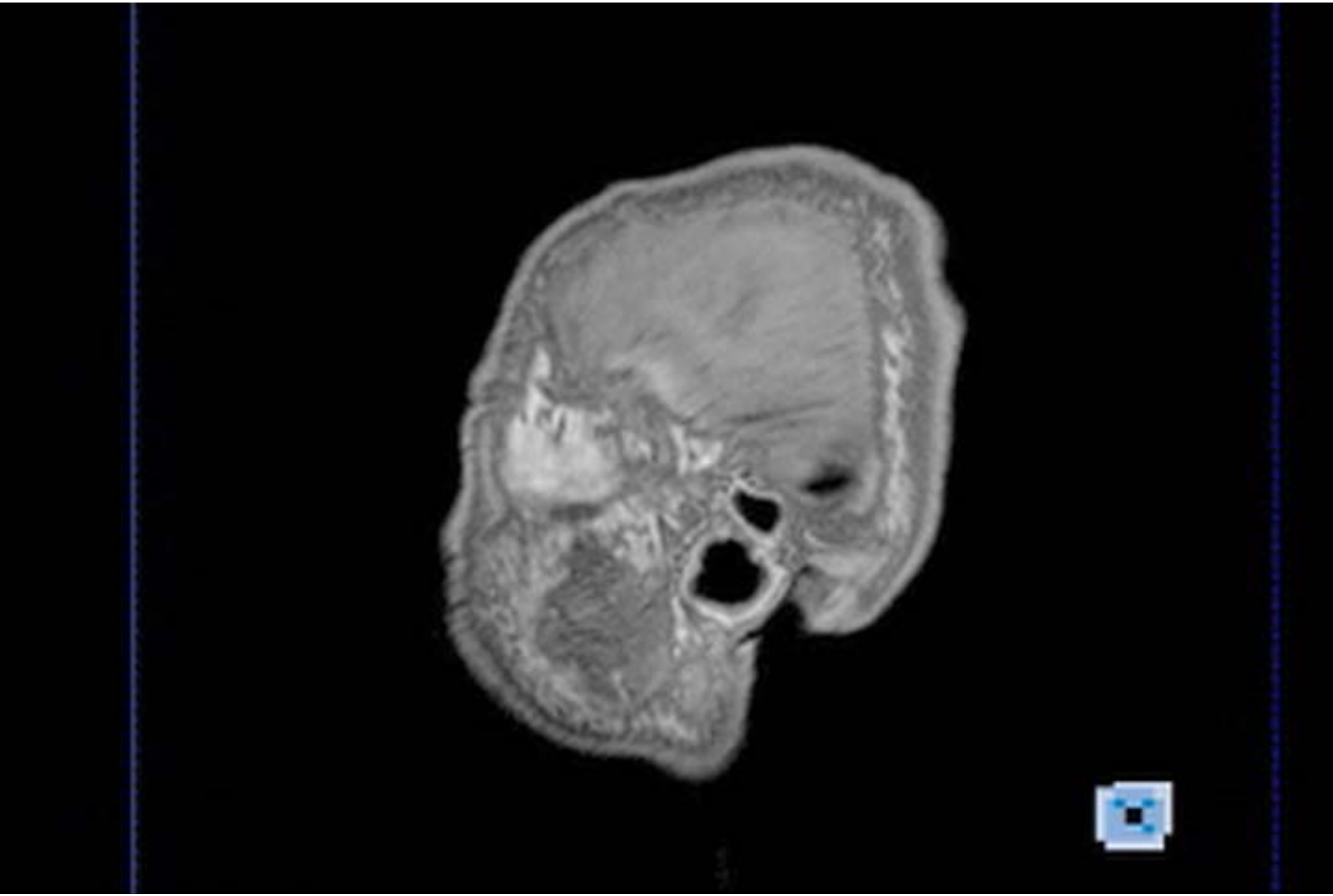
CT



MRI

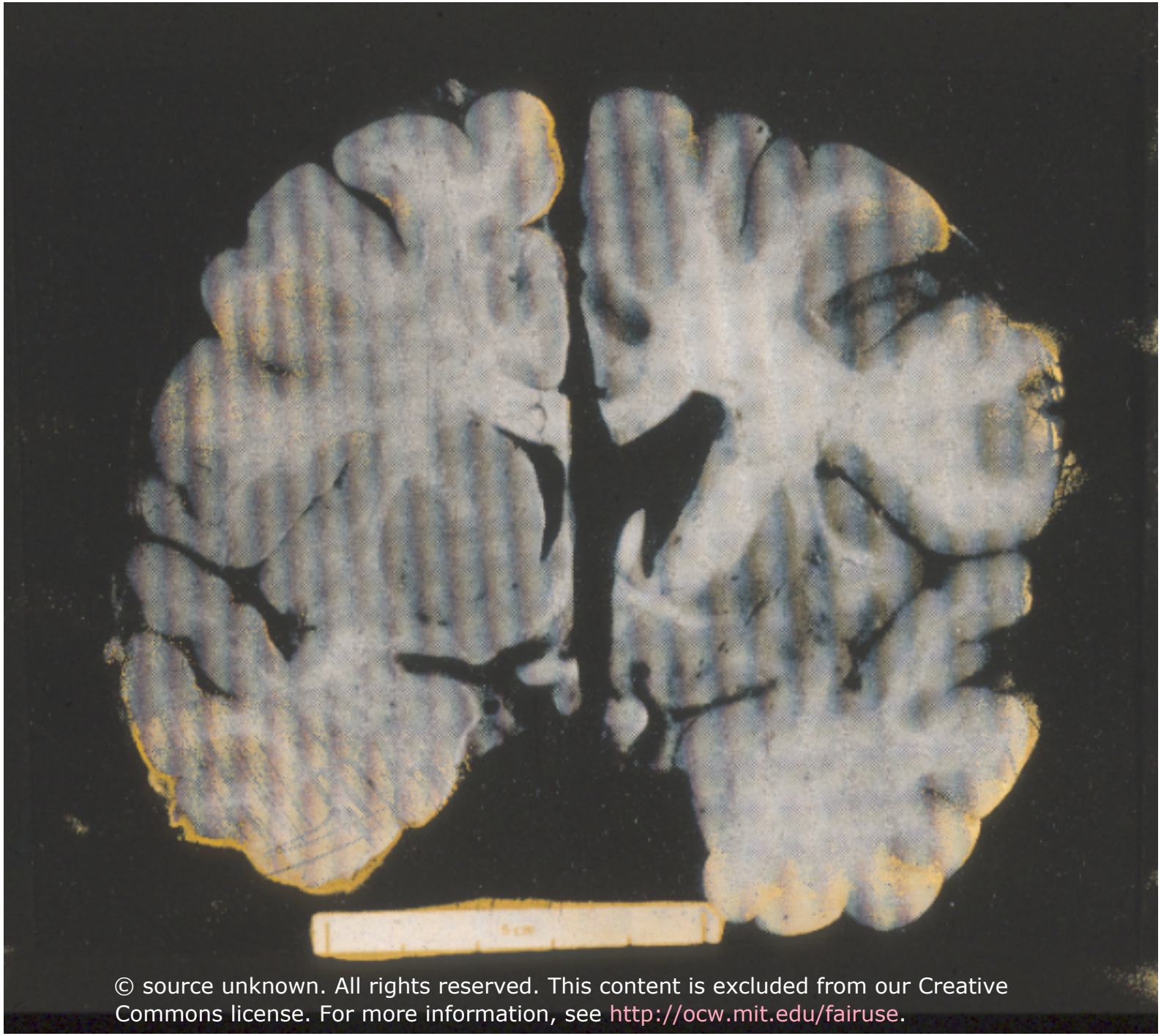
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MRI – Lateral Views



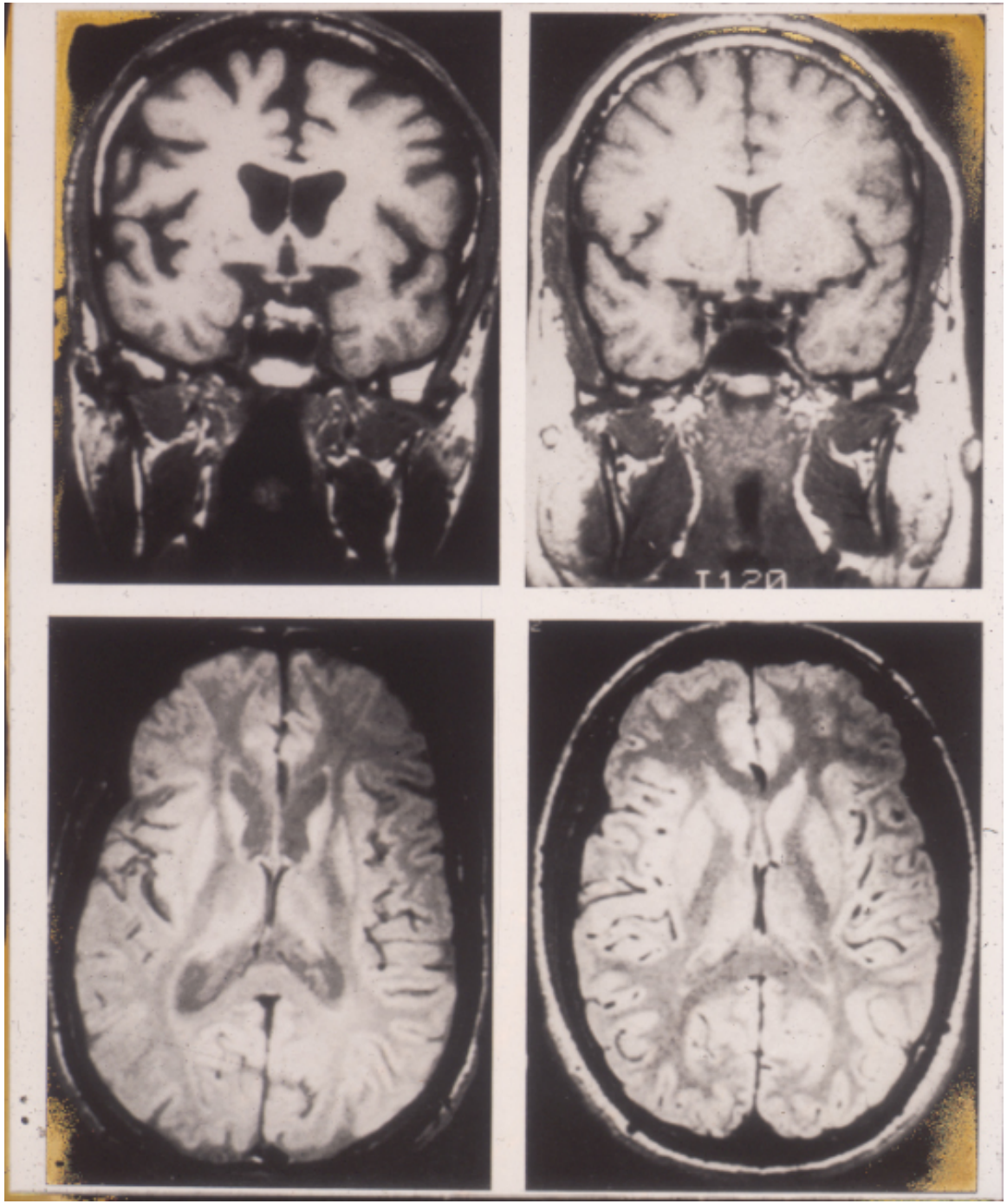
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Huntington's disease – *post mortem*



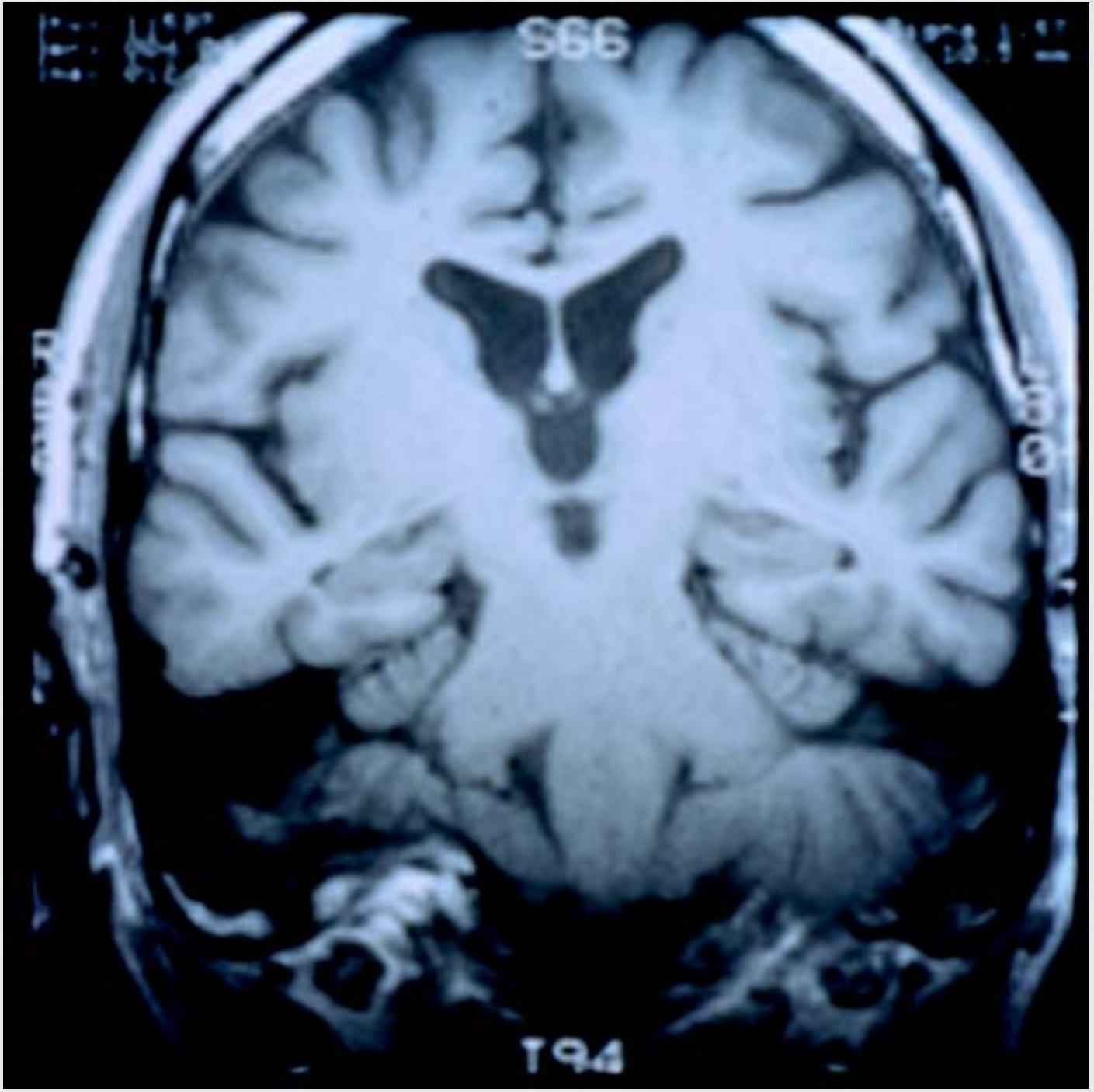
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Huntington's disease – *in vivo*



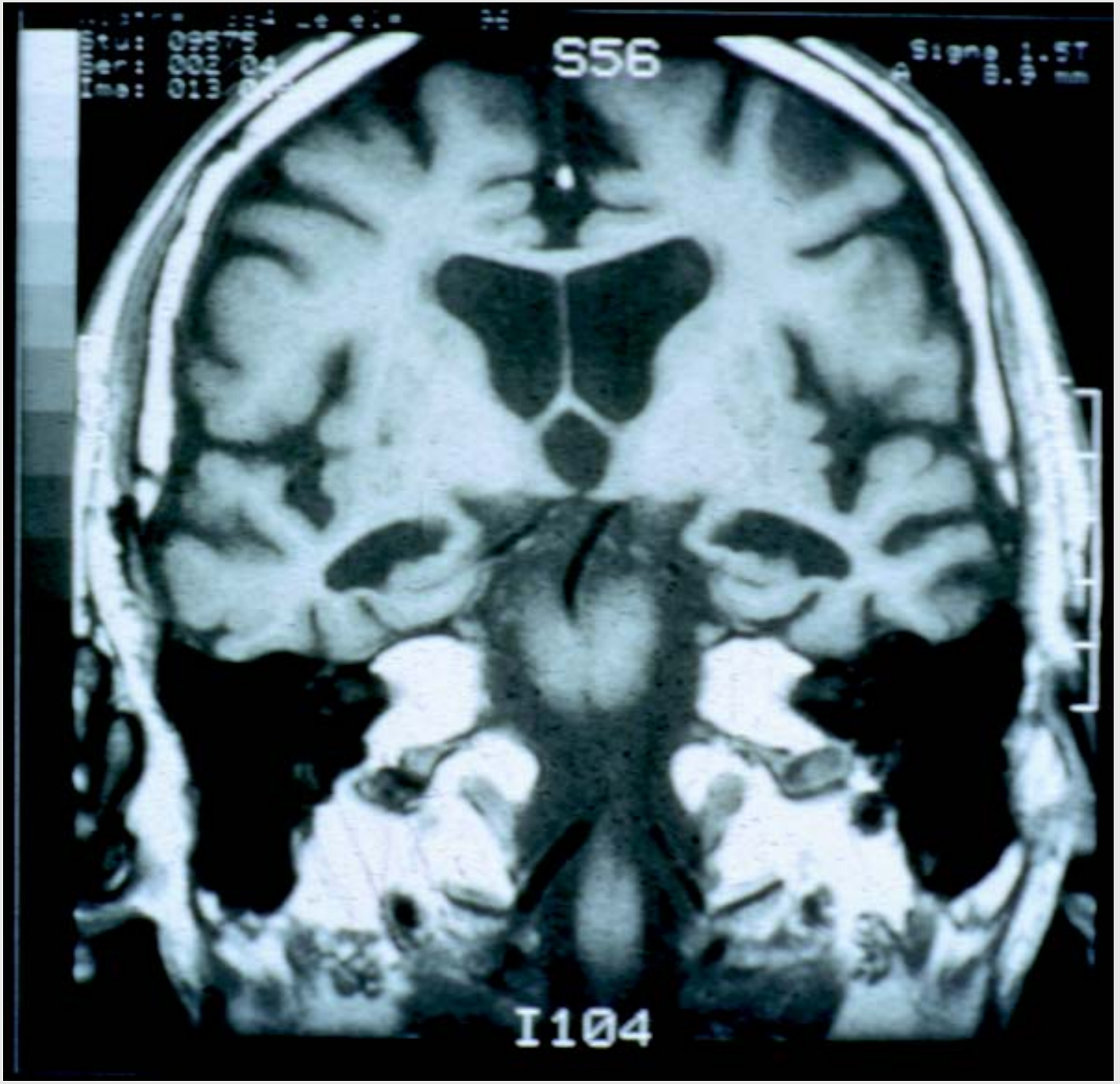
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Healthy Older Individual



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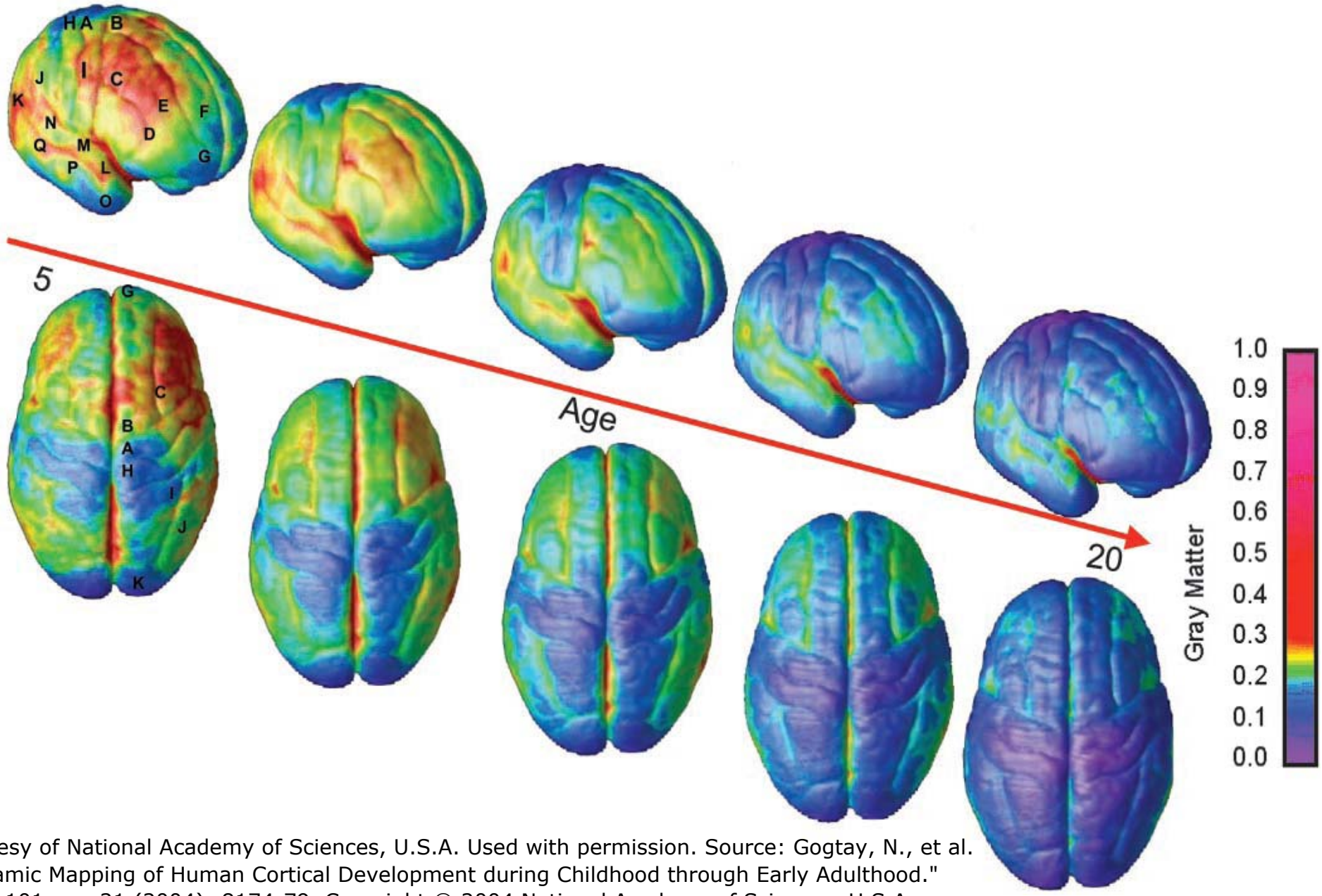
Individual with Alzheimer's Disease



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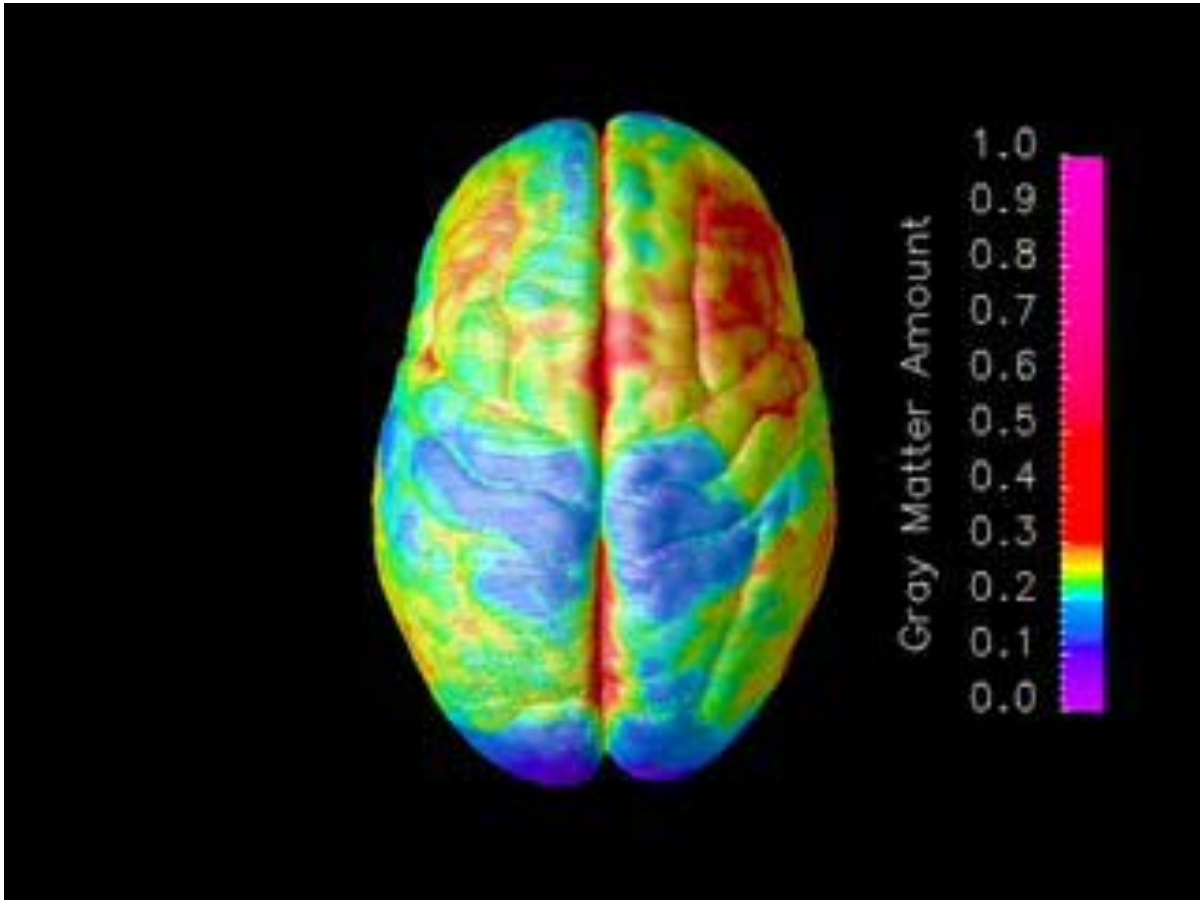
RECORDING

Structure – Brain Changes in Development

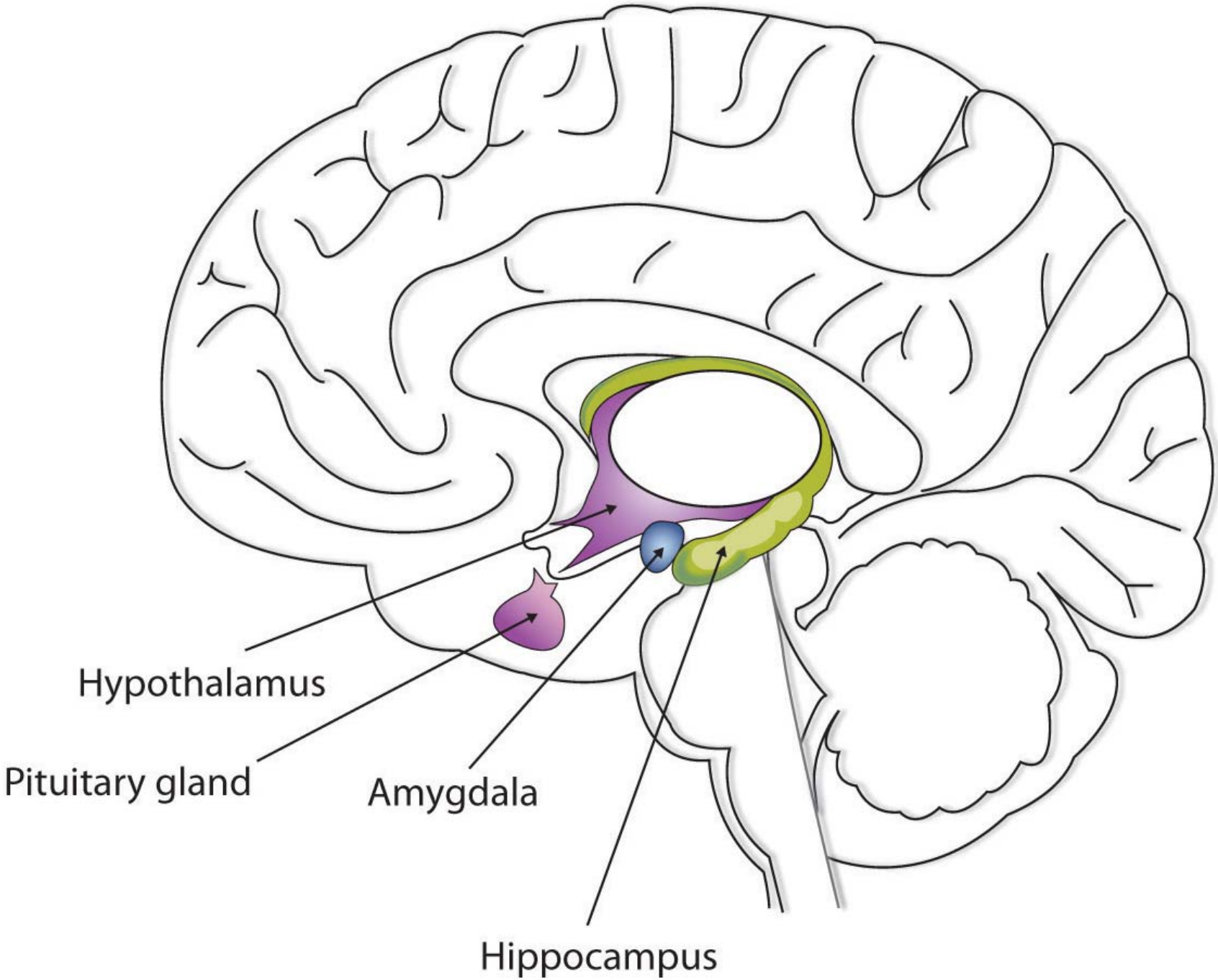


Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Gogtay, N., et al. "Dynamic Mapping of Human Cortical Development during Childhood through Early Adulthood." *PNAS* 101, no. 21 (2004): 8174-79. Copyright © 2004 National Academy of Sciences, U.S.A.

Cortical Brain Growth Ages 4-21



Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Gogtay, N., et al. "Dynamic Mapping of Human Cortical Development during Childhood through Early Adulthood." *PNAS* 101, no. 21 (2004): 8174-79. Copyright © 2004 National Academy of Sciences, U.S.A.



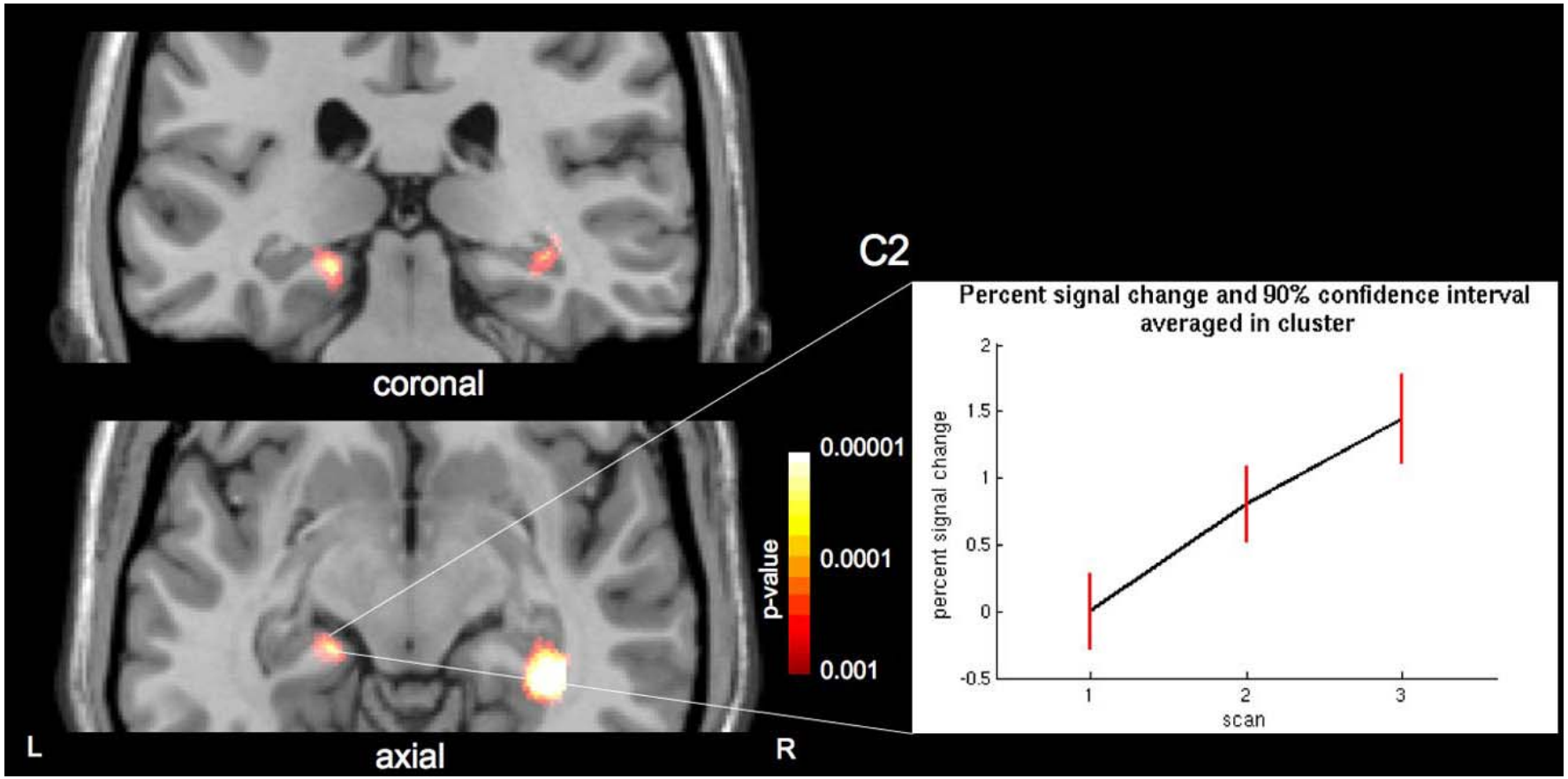
Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.

RECORDING

Structure – Brain Changes with Learning

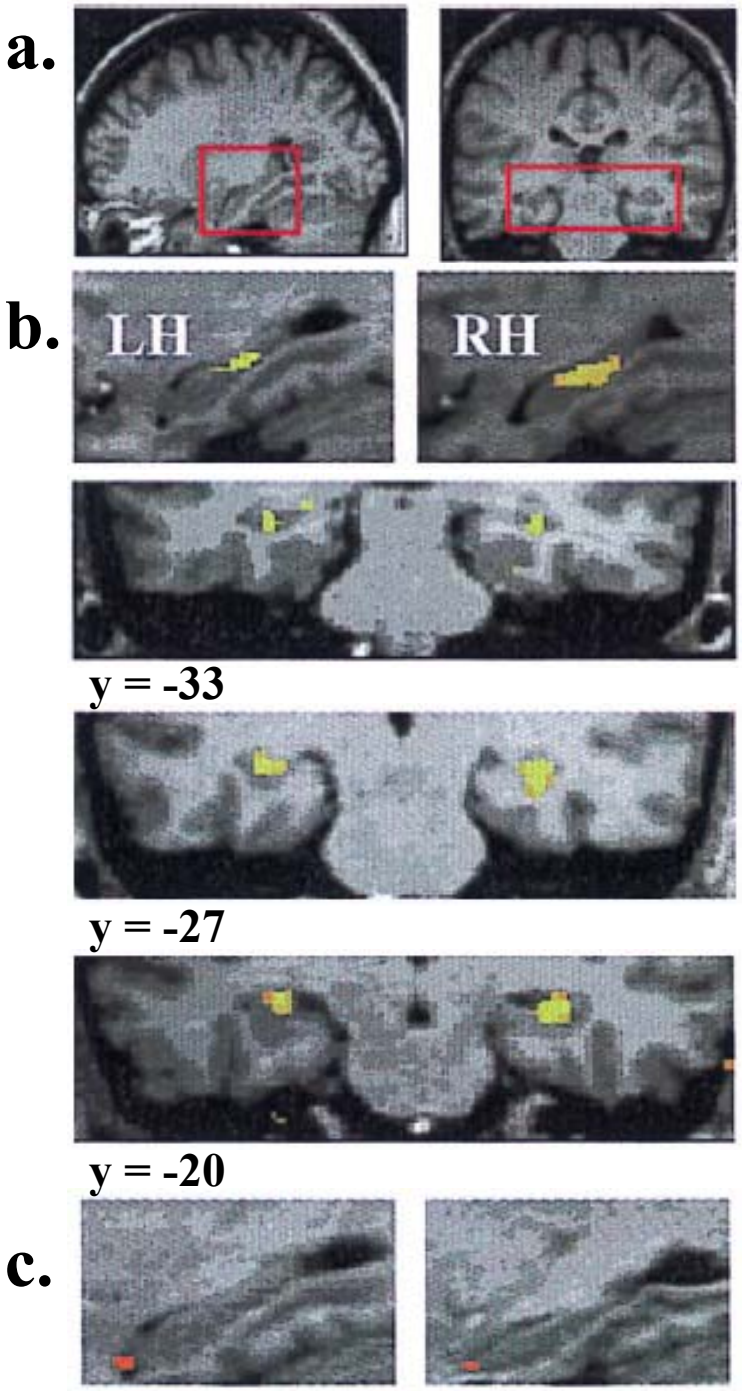
Medical students taking the German preliminary medical exam

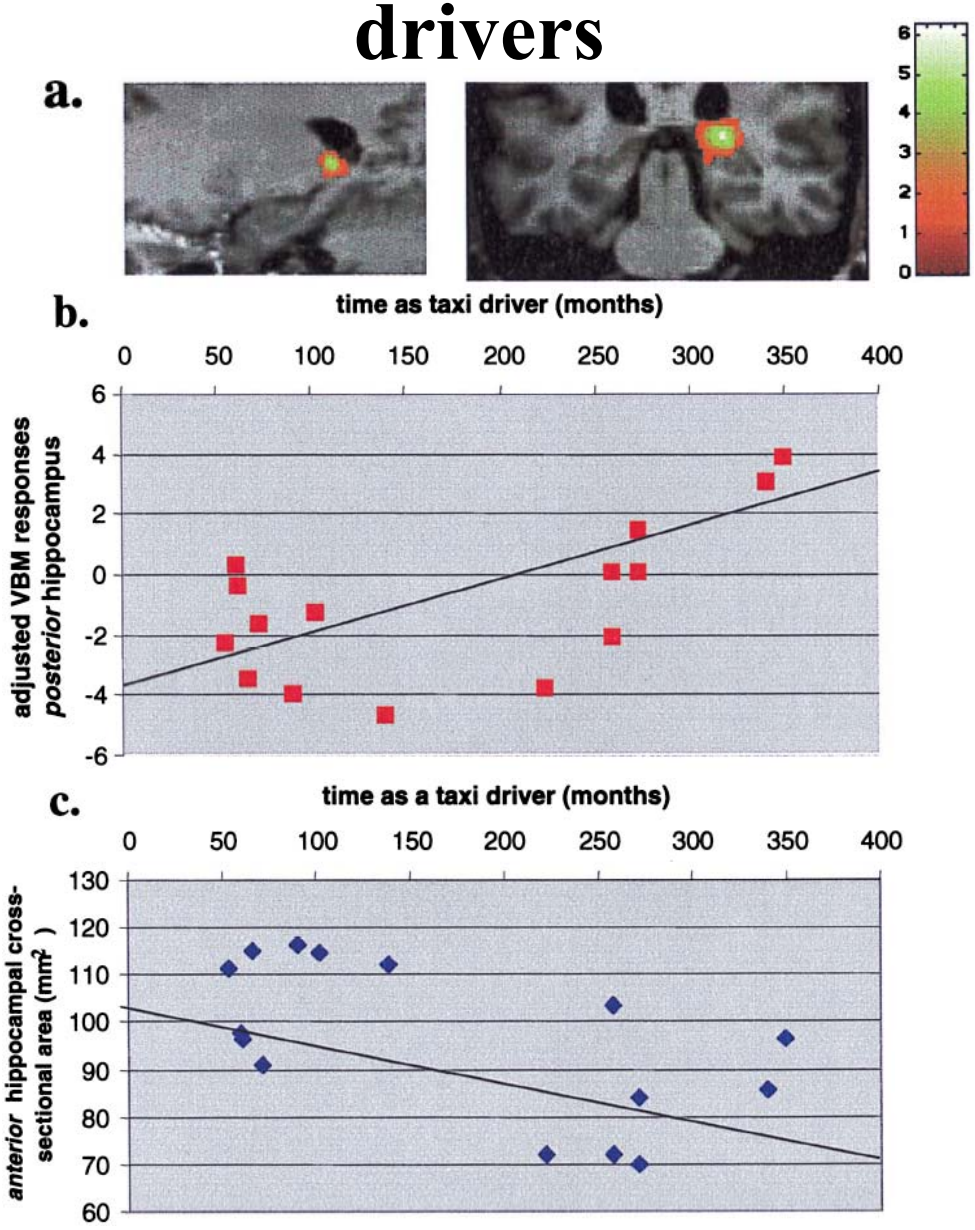
Hippocampus Voxel Based Morphometry



Source: Draganski, B., et al. *J Neurosci 26*, no. 23 (2006): 6314-7. © Society for Neuroscience. All rights reserved.
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Navigation-related structural change in the hippocampi of taxi drivers





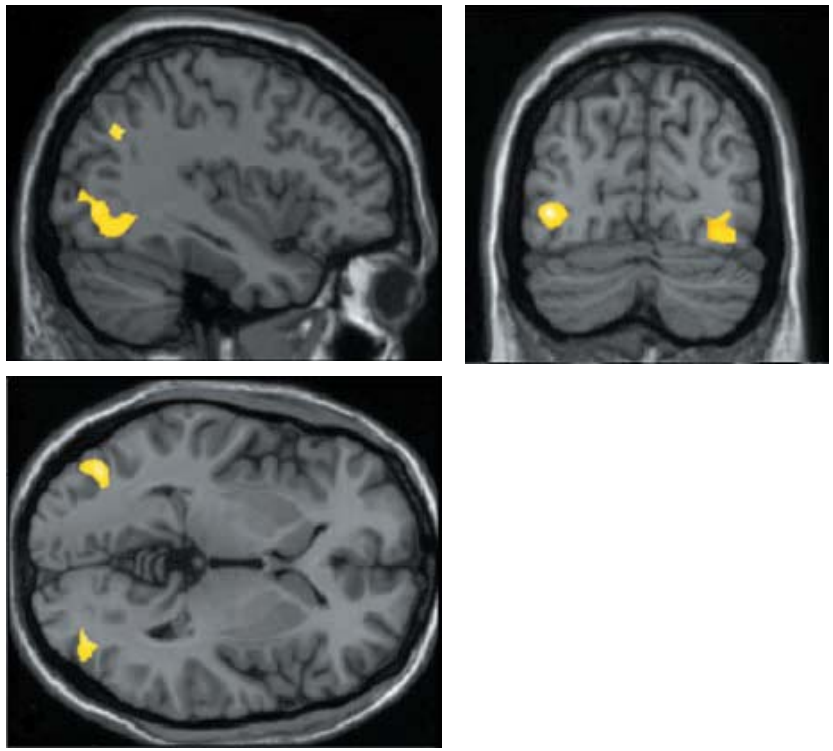
Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Maguire, E. A., et al. "Navigation-related Structural Change in the Hippocampi of Taxi Drivers." *Proceedings of the National Academy of Sciences of the United States of America* 97, no. 8 (2000): 4398-403. Copyright © 2000 National Academy of Sciences, U.S.A.

RECORDING

Structure – Brain Changes with Learning

Three-ball juggling routine 3 month

hMT/V5



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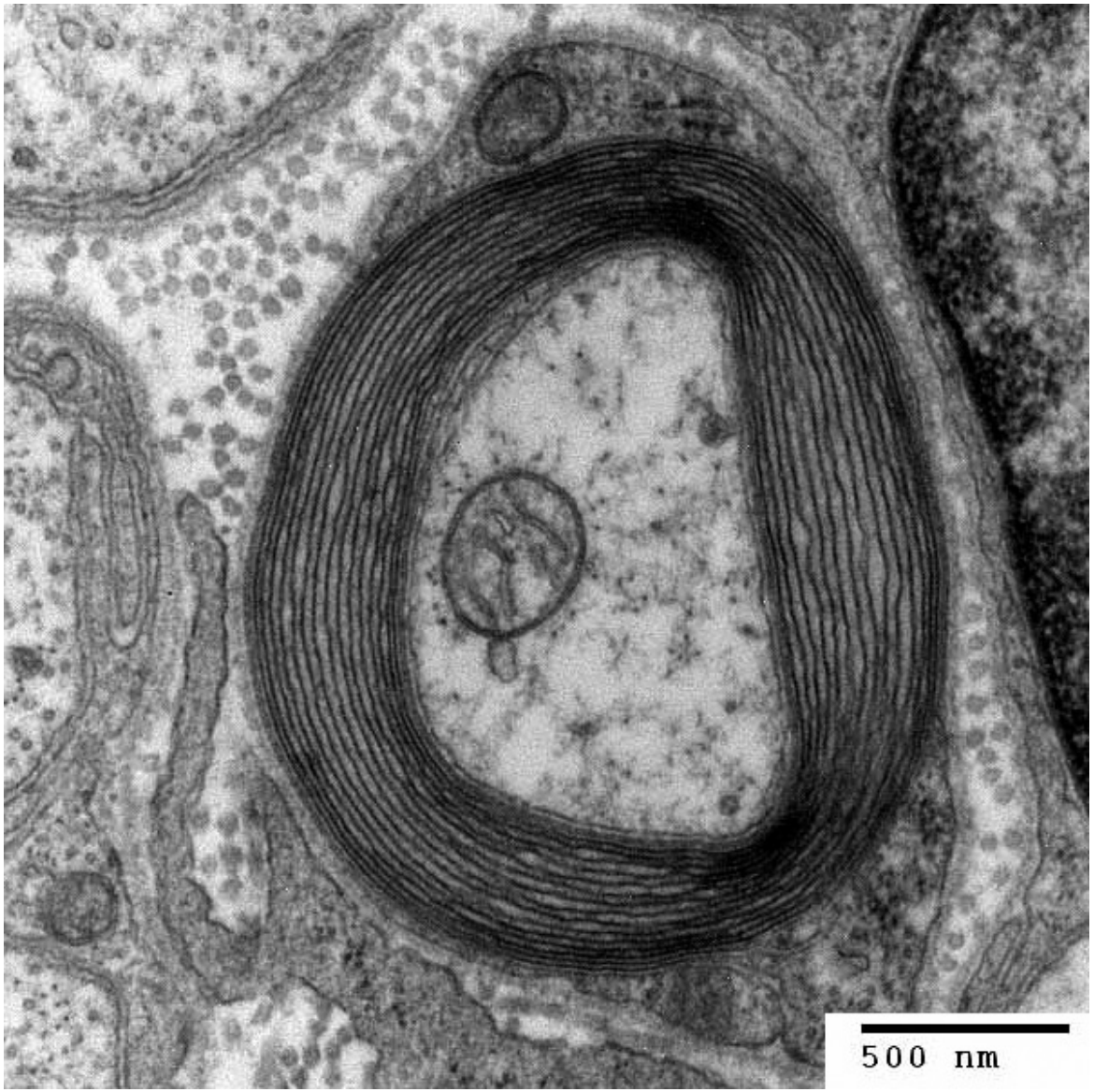
Photo courtesy of madaboutasia on Flickr.

Diffusion Tensor Imaging (DTI)

- visualizes white matter connectivity in the brain

- measures movement of water at microstructural level (microns)

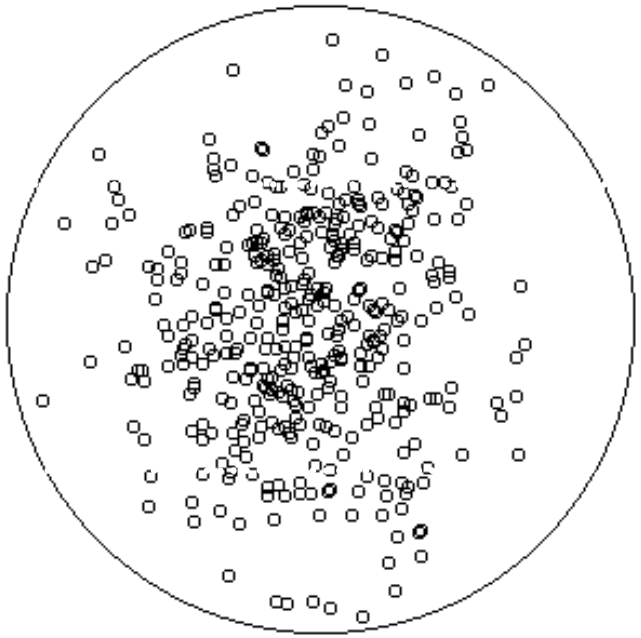
Myelinated Nerve Fiber



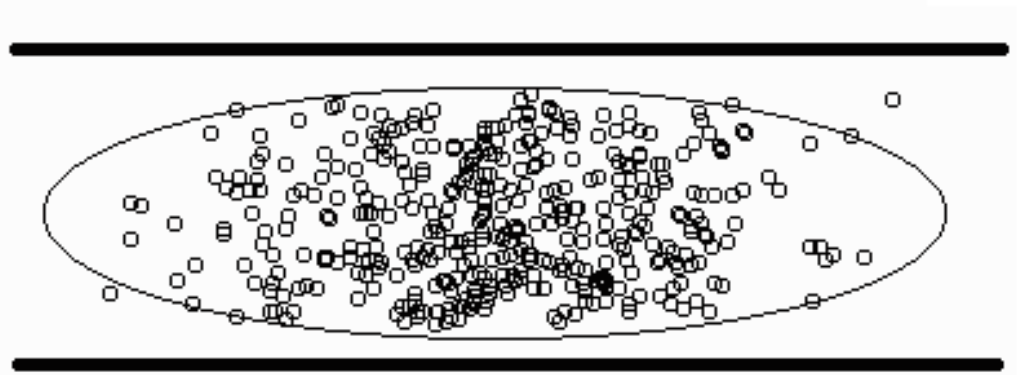
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Diffusion anisotropy: Effects of myelination

Weak/no myelin barrier

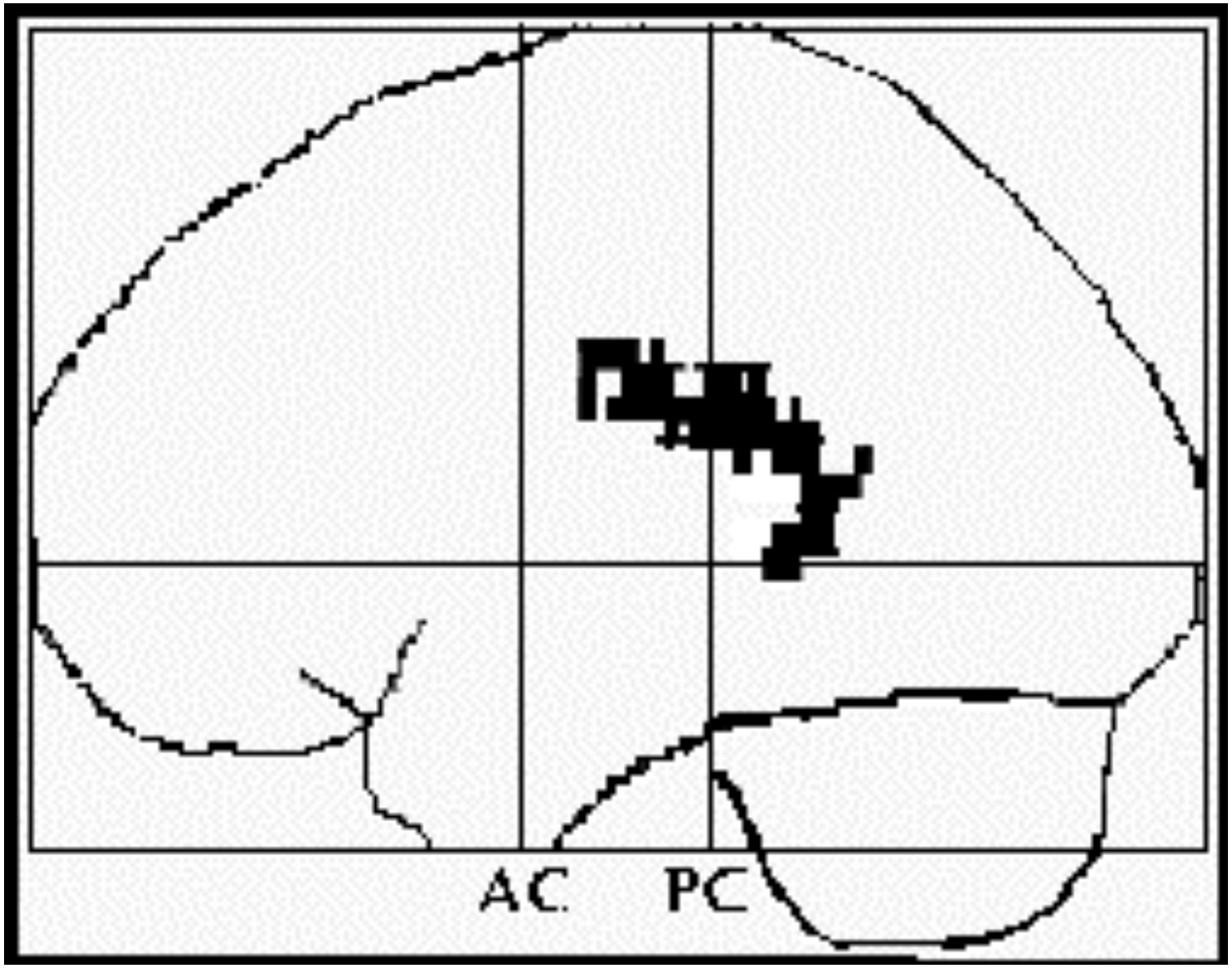


Strong myelin barrier



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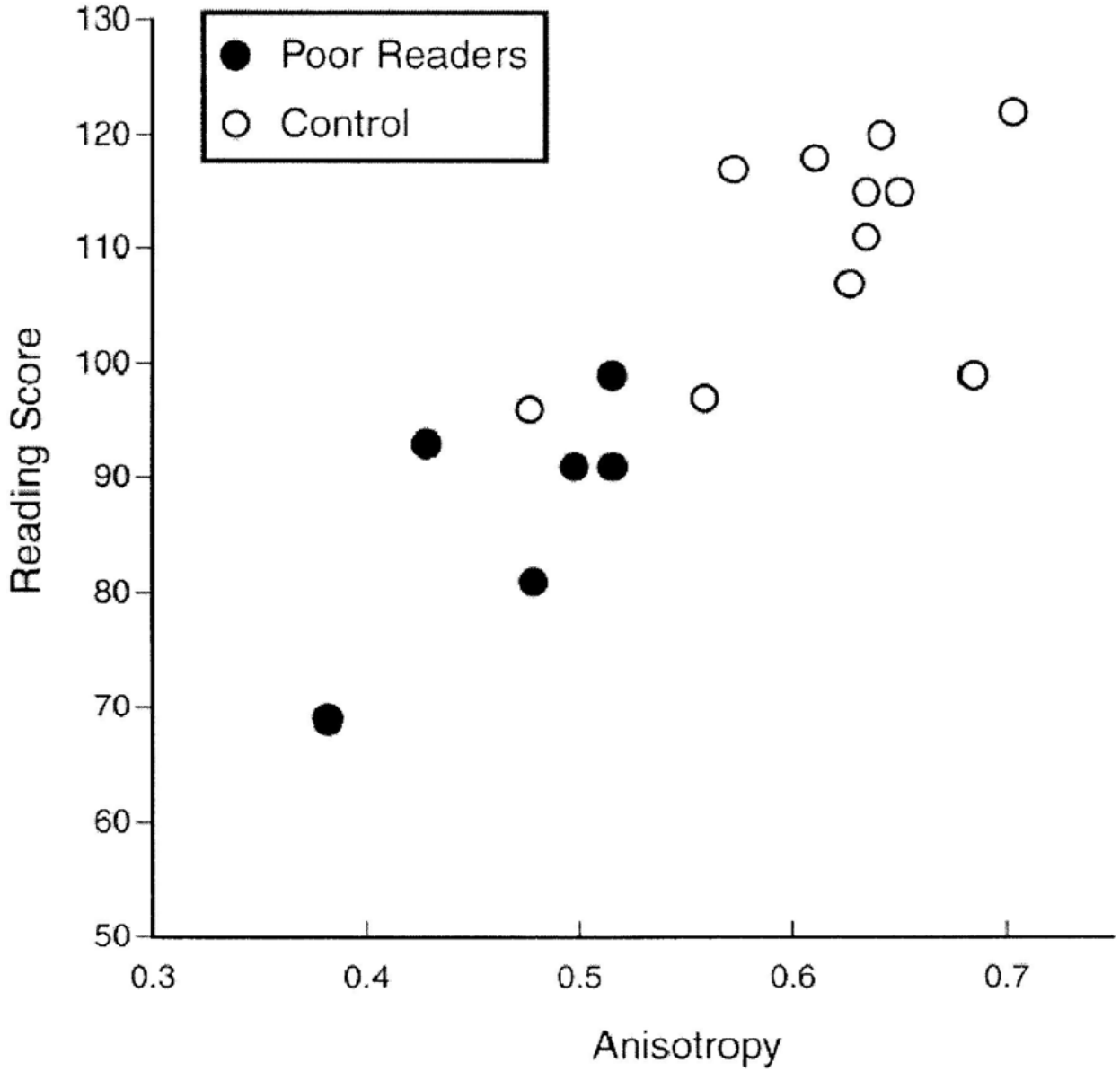
DIFFERENCE IN DTI (ANISOTROPY) BETWEEN DYSLEXIC AND CONTROL GROUPS



AC = Anterior Commissure **PC = Posterior Commissure**

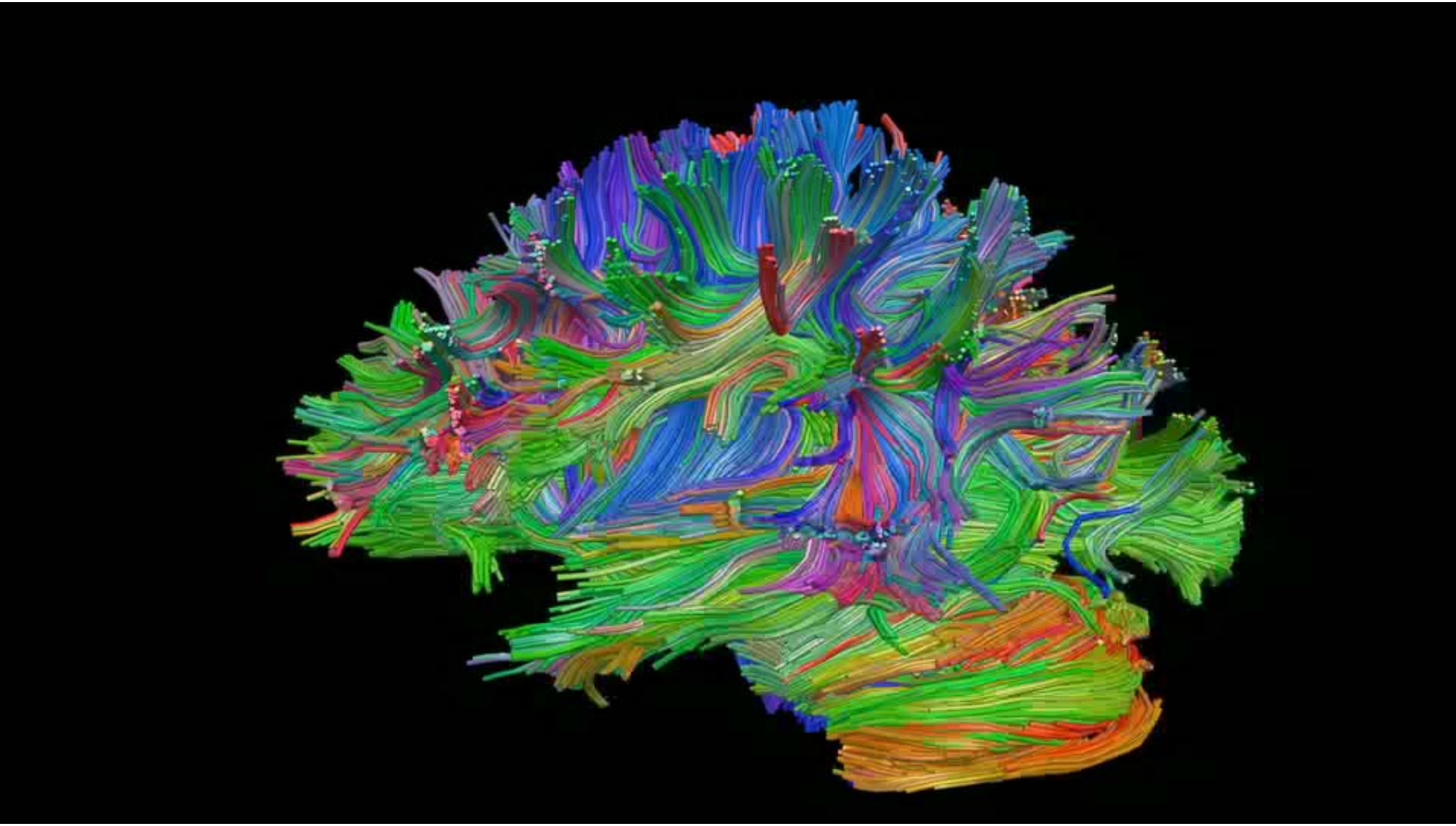
Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission. Source: Klingberg, T., et al. *Neuron* 25 (2000): 493-500.

Anisotropy & Reading Skill In Adults With or Without Dyslexia



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Diffusion Tensor Imaging (DTI) – Tractography



red = left-right; blue = up-down; green = front-back

Courtesy of Satrjit Ghosh / McGovern Institute. Used with permission.

OUTLINE

1) Lesion
2) Stimulation
3) Recording
 a. Structure
 b. Function
 i. Electrical/Magnetic
 - EEG
 - MEG
 ii. Metabolic
 - PET
 - fMRI

Goals:
- *introduce techniques*
- *present strengths and limitations*

RECORDING

Function - resolution

Spatial resolution: how specific can the source of signal be localized

Temporal resolution: time scale of the particular measurement

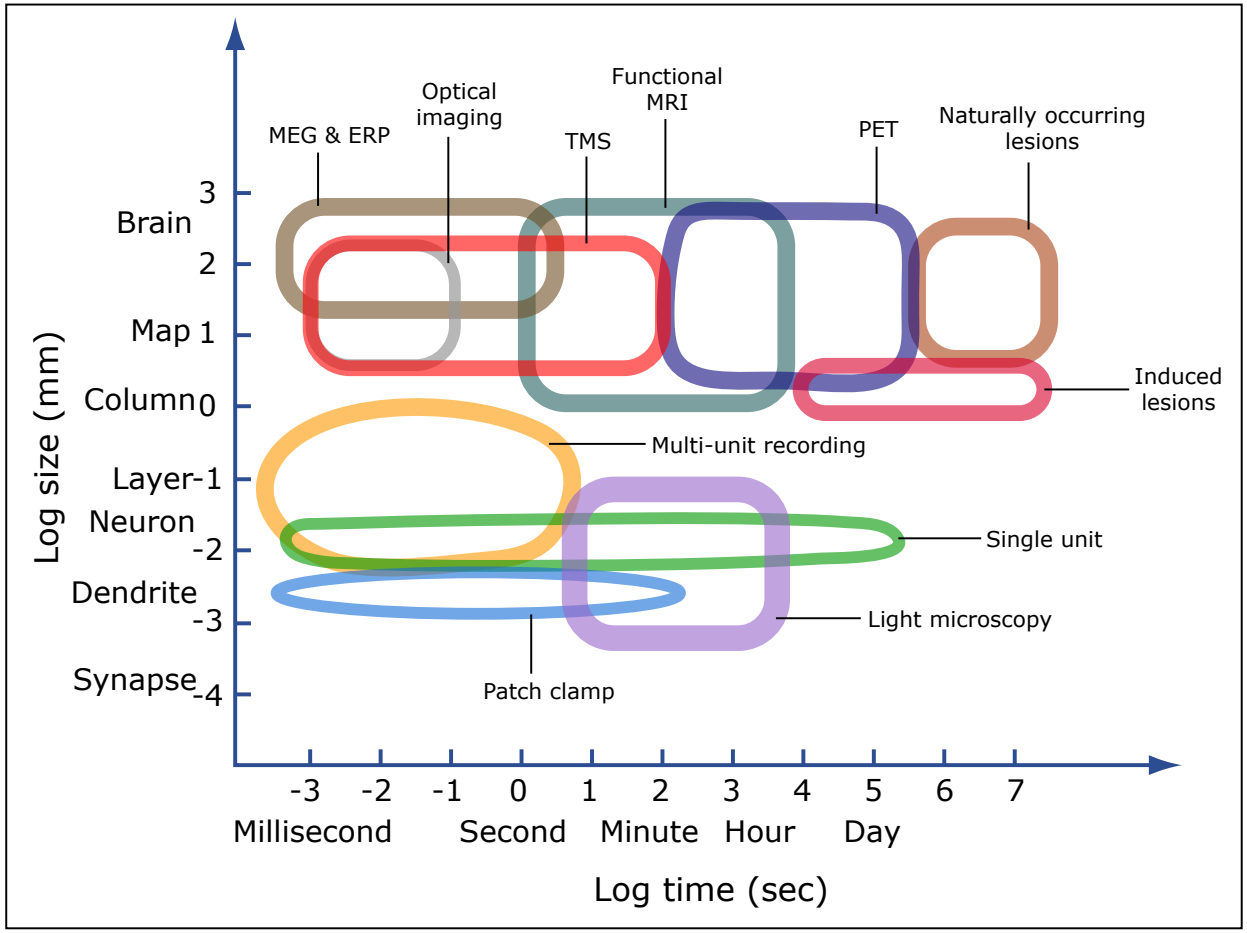


Image by MIT OpenCourseWare.

RECORDING

EEG - Principles



Courtesy of University of Oregon Child and Family Center.

- Electroencephalogram

- measures changes in electrical activity

- uses surface electrodes placed on the scalp (16-256)

- signal requires a ***few hundred thousand*** ***neurons to fire synchronously***

RECORDING

EEG vs ERP

- EEG measures OVERALL brain activity - not related to stimulus presentation

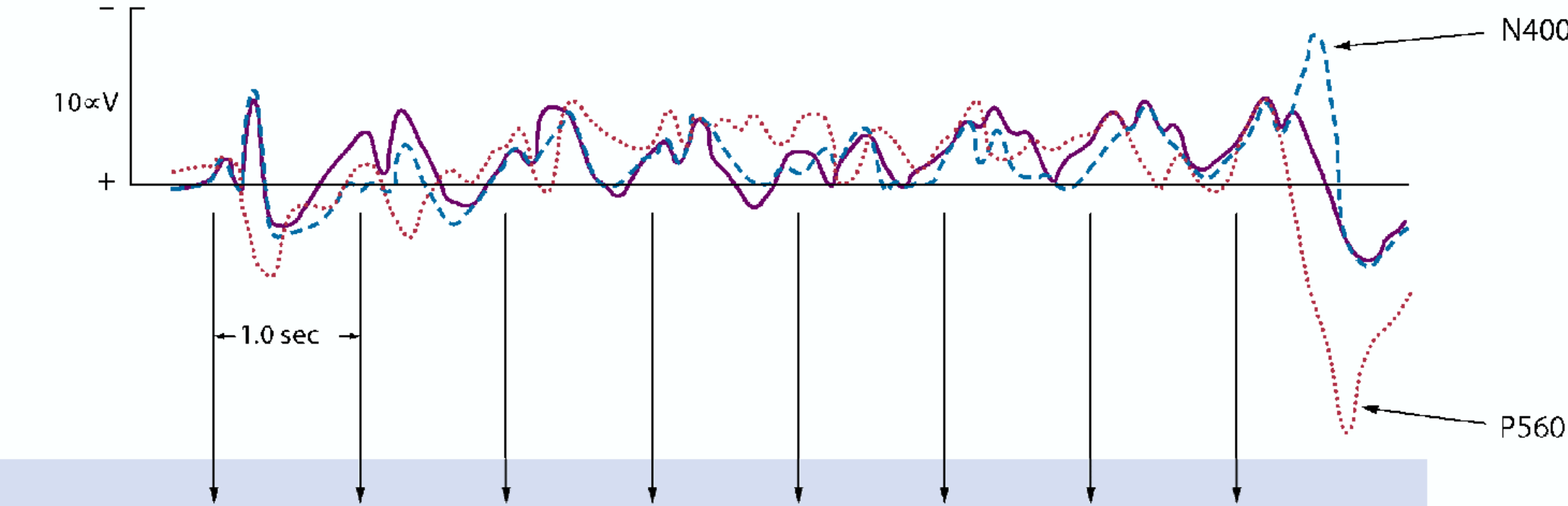
- Event-related Potentials (ERP)

- time-locked to stimulus

- averaged over trials

Images of EEG and ERP waveforms removed due to copyright restrictions. See lecture video and Figures 4.24 and 4.25 in Gazzaniga, M., R. Ivry, and G. Mangun. *Cognitive Neuroscience*. 2nd ed. W. W. Norton & Co., 2002.

ERPs & Language



———	XXXXX	It	was	his	first	day	at	work.
- - - - - - -	XXXXX	He	spread	the	warm	bread	with	socks.
.....	XXXXX	She	put	on	her	high	heeled	shoes.

N400 – semantic deviance; P560 – physical deviance

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RECORDING

EEG/ERP – Strengths & Limitations



Strengths

- great temporal resolution (10ms)
- extremely non-invasive
- relatively inexpensive

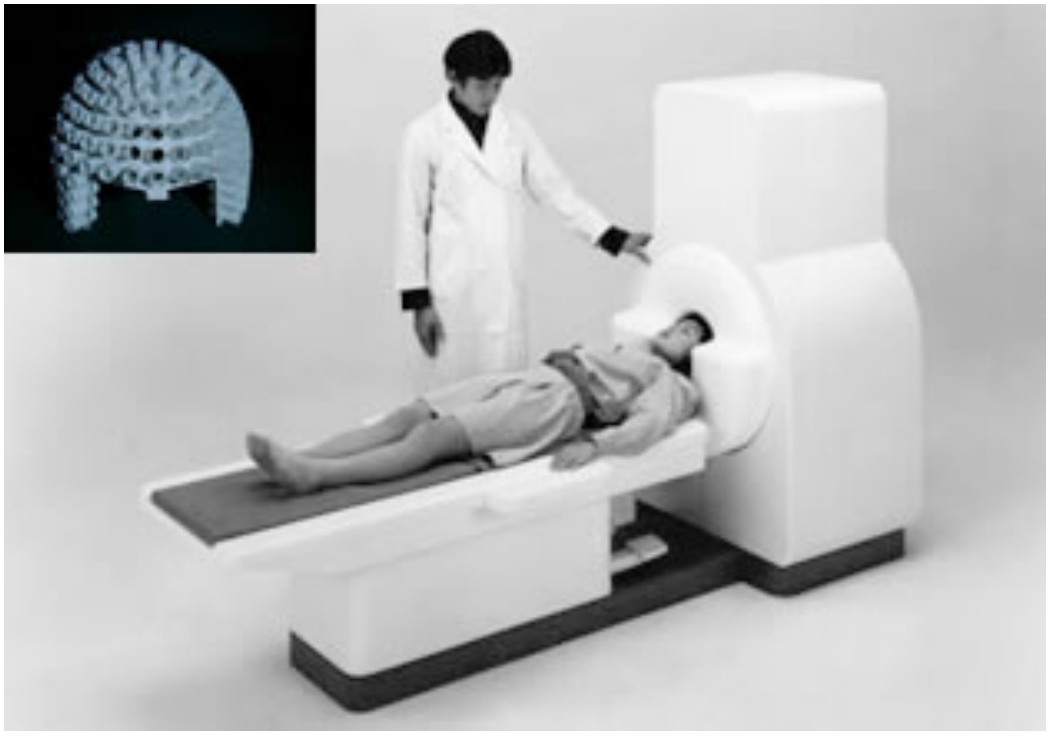
Limitations

- poor spatial resolution
- records large population of neurons
- “where is (are) the signal generators?”
- many trials needed for averaging

RECORDING

MEG - Principles

- Magnetoencephalography



Courtesy of STAR Cryoelectronics, Susumu Matsukura (Yokogawa Electric Corporation) and Gen Uehara (Kanazawa Institute of Technology). Used with permission.

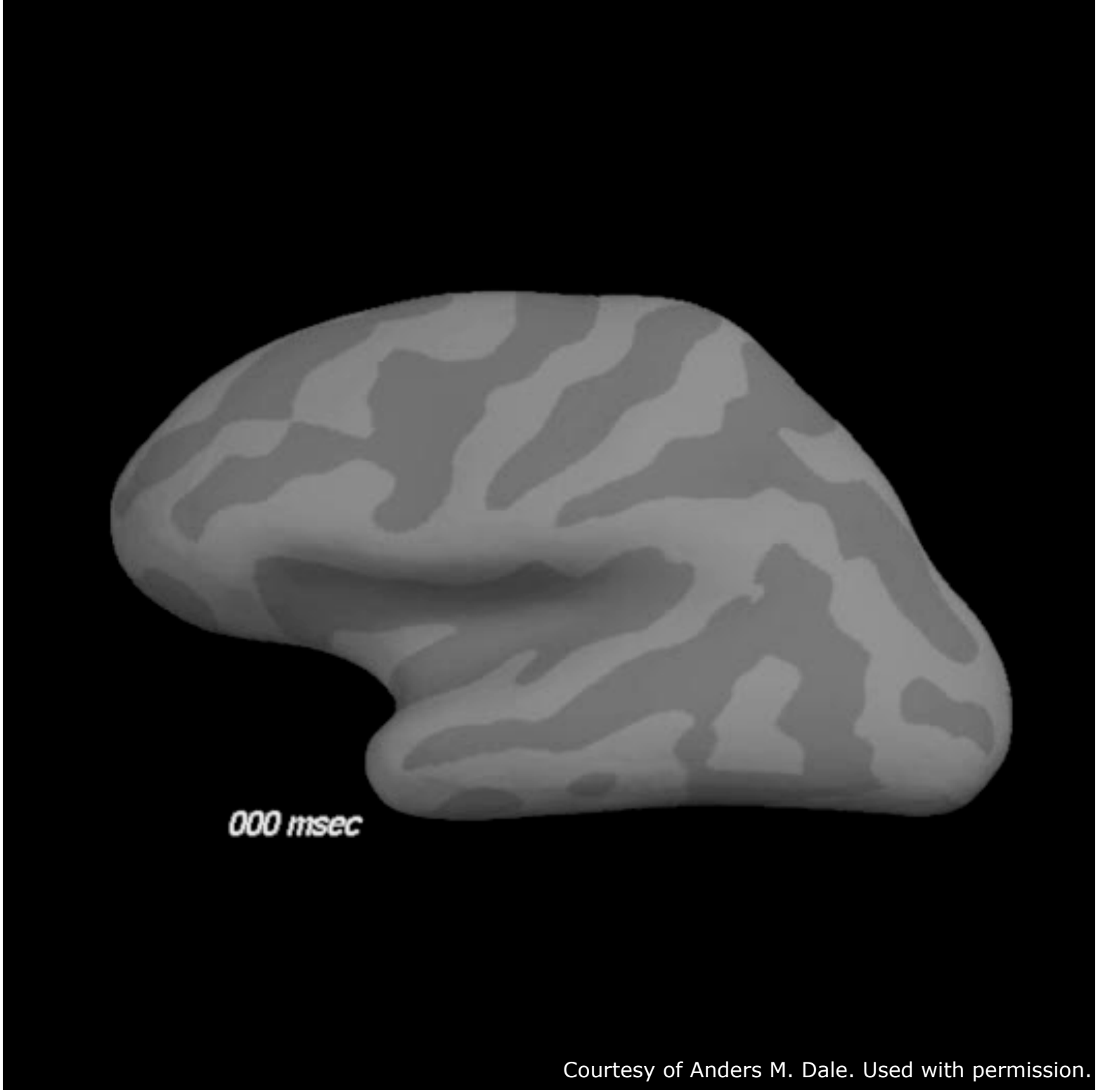
- active neurons produce small magnetic fields

- uses Superconducting Quantum Interference Devices (SQUIDs) to detect magnetic changes

- signals are 100 million time smaller than the earth's magnetic field

Reading a word

Dale & Halgren,
Neuron, 2000



Courtesy of Anders M. Dale. Used with permission.

RECORDING

MEG – Strength & Limitations

Strengths

- great temporal resolution (10ms, exactly like ERP)
- non-invasive

Limitations

- okay spatial resolution (better than ERP b/c magnetic signal does not get distorted going through skull/scalp, unlike electrical signal)
- many trials needed for averaging
- can only measure neurons parallel to the skull
- expensive (> $1 million)

OUTLINE

1) Lesion
2) Stimulation
3) Recording

a. Structure

b. Function

i. Electrical/Magnetic
 - EEG
 - MEG

ii. Metabolic
 - PET
 - fMRI

Goals:
- *introduce techniques*
- *present strengths and limitations*

RECORDING

Metabolic Activity

- Neurons require energy (oxygen and glucose)

- brain area active, increased blood flow brings energy supplies

BRAIN FACTS

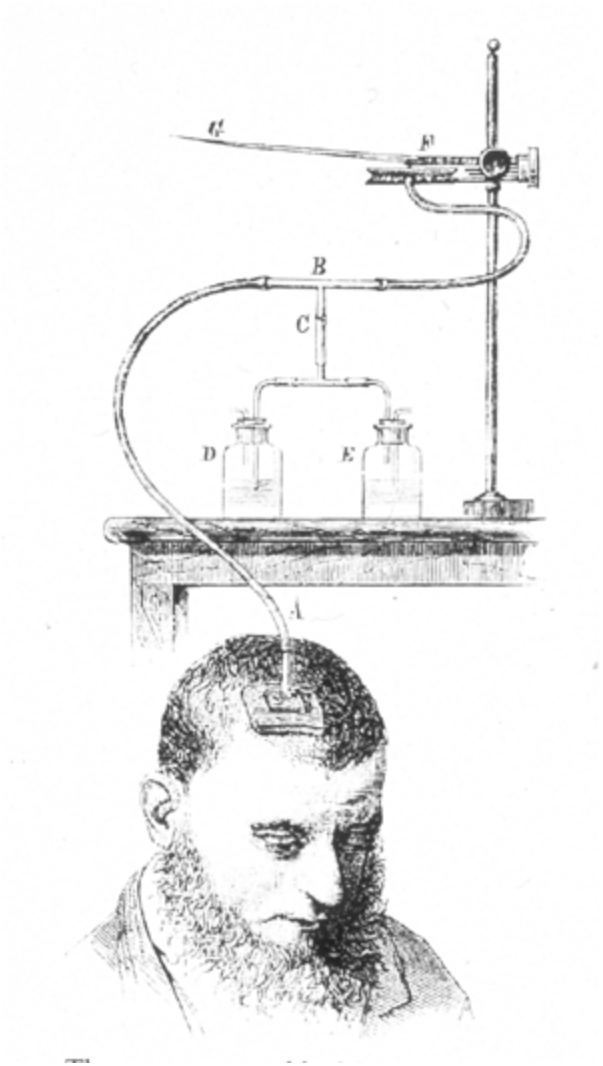
- 3 1/2 pounds

- 2% total body mass

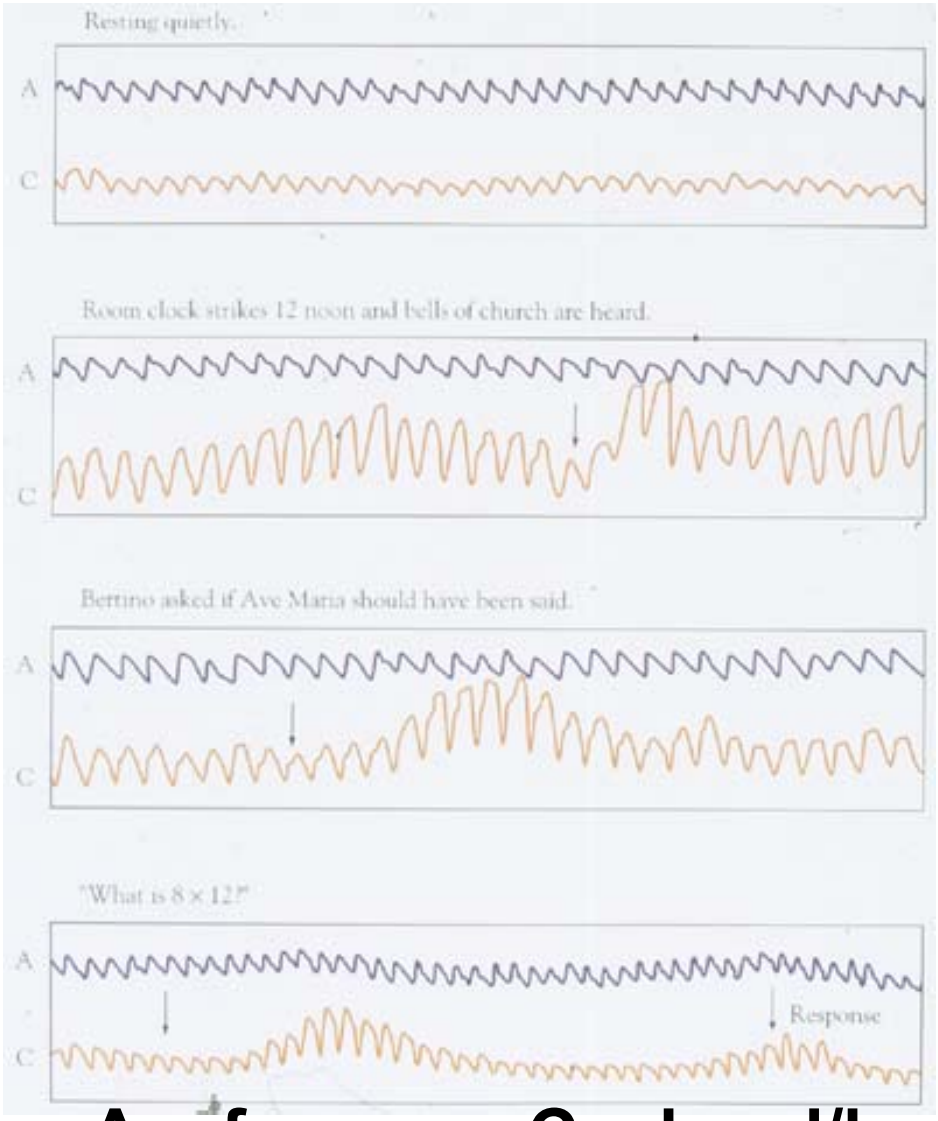
- 20% of body's oxygen

- loss of oxygen (10 min) causes irreversible brain damage

Cerebral blood flow
Angelo Mosso - late 1880s



Public domain image.



Resting

Noon bells

Ava Maria?

8 x 12?

A = forearm; C = head/brain

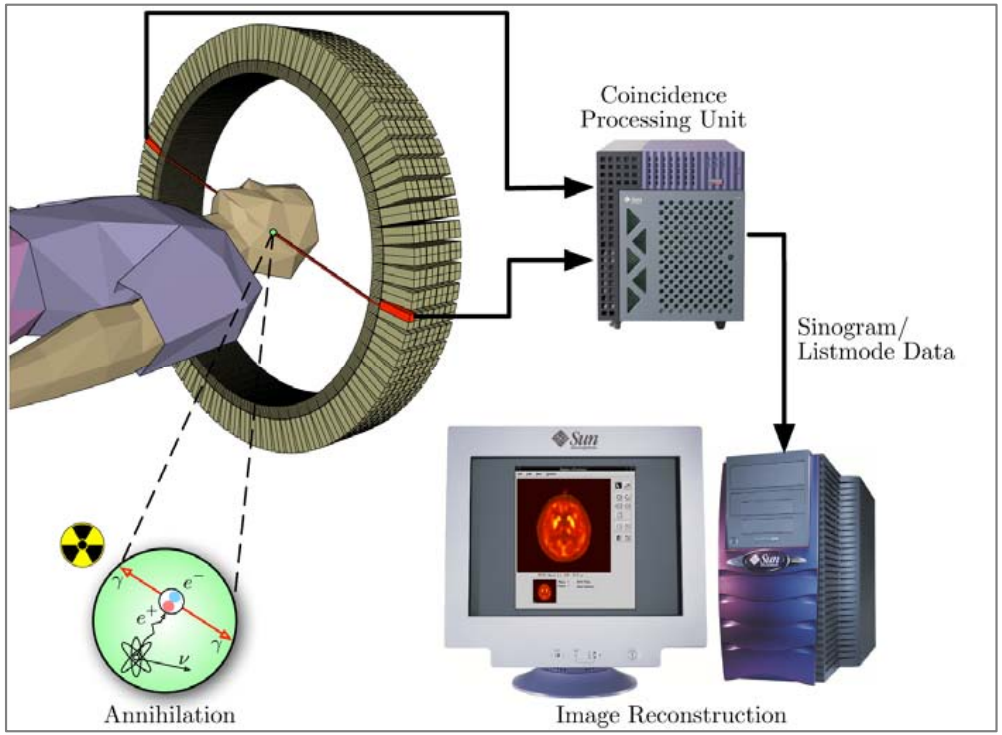
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RECORDING

PET



Courtesy of Marcus E. Raichle. Used with permission.



Public domain image (Wikipedia).

- Positron emission tomography

- measures local variation in cerebral blood flow (CBF) correlated with mental activity (thinking about a word)

TASKS

+ + + + +

TASKS

+ + + + +

rose cat apple pen plane

TASKS

\+ + + + +

Fixation/Rest

rose cat apple pen plane

Looking at word

rose cat apple pen plane

Saying the word

rose cat apple pen plane

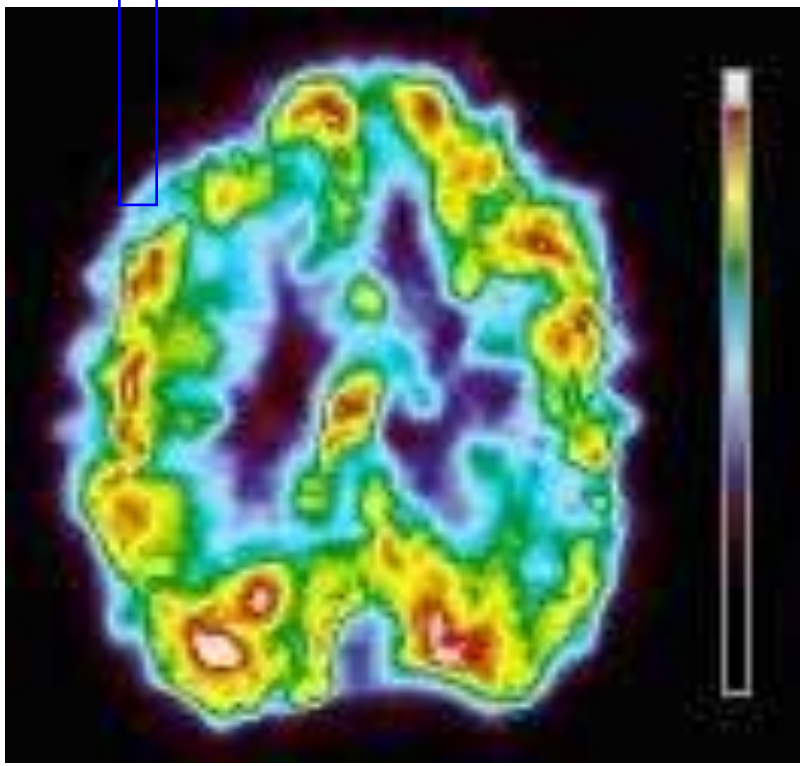
Thinking about the word - verb generation

RECORDING

PET - Experimental Design

Verb Generation

rose **cat** **apple** **pen**



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How to isolate region specific for verb generation?

- **Use Subtraction Method:**

 - **Find control task that differs only in the process of interest (in this case verb generation)**

 - **Subtract out irrelevant processes**

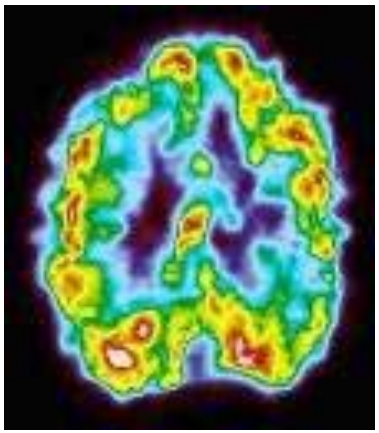
Hierarchical Design of the Lexical Access Experiment

Control state	Stimulated state	Cognitive operations
Fixation point only	Passive words	Passive sensory processing Word-level coding
Passive words	Repeat words	Articulatory coding Motor programming and output
Repeat words	Generate uses	Semantic association Selection for action

RECORDING

Imaging - Experimental Design

TASK



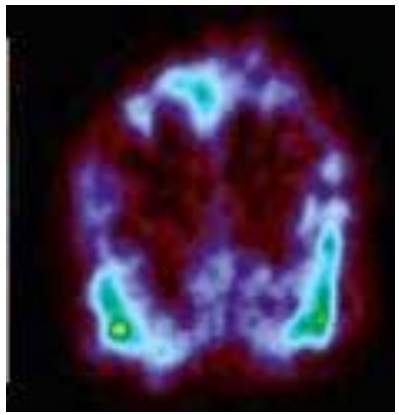
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generating verb

~~reading~~

~~speaking verb~~

CONTROL



~~reading~~

~~speaking verb~~

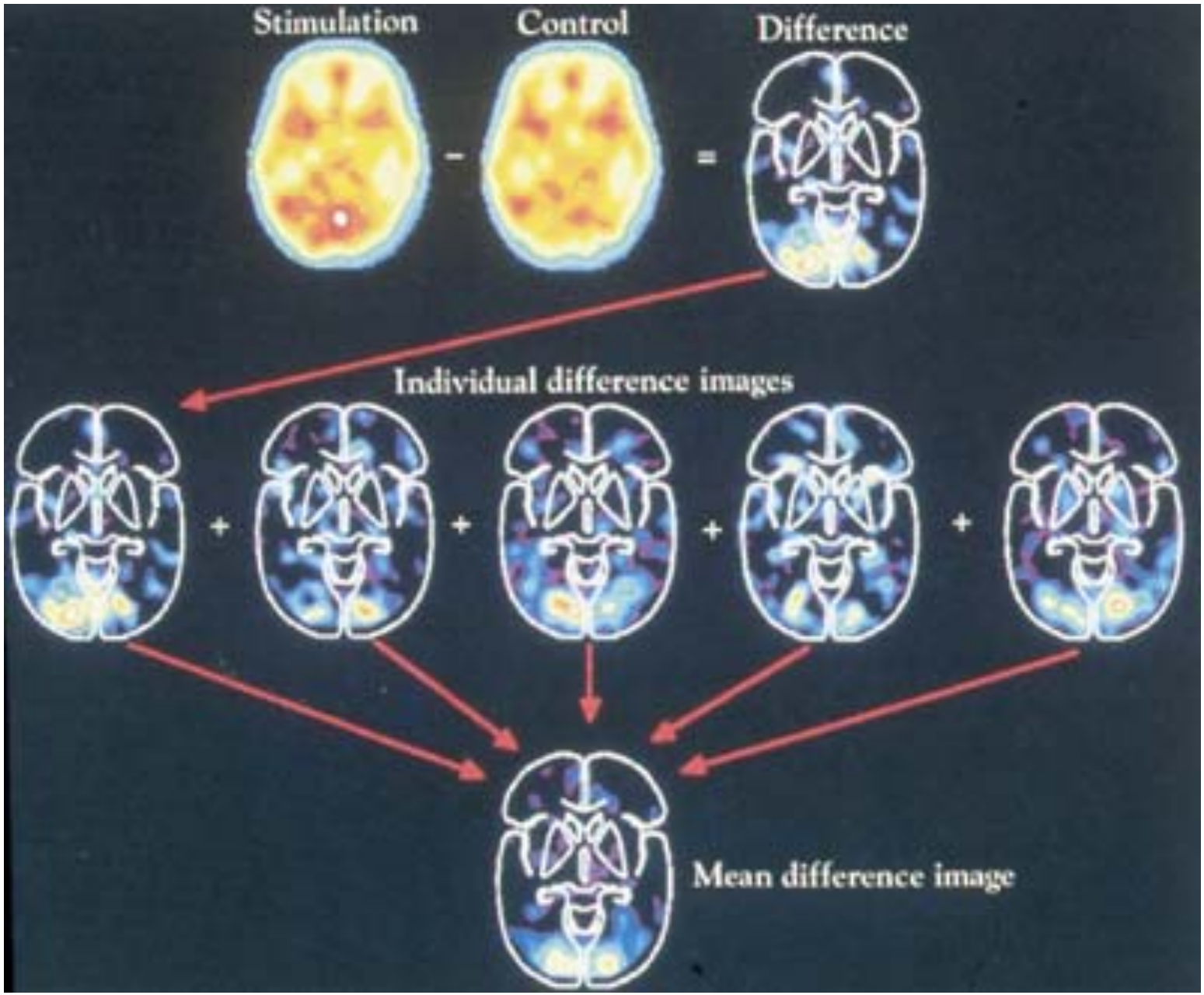


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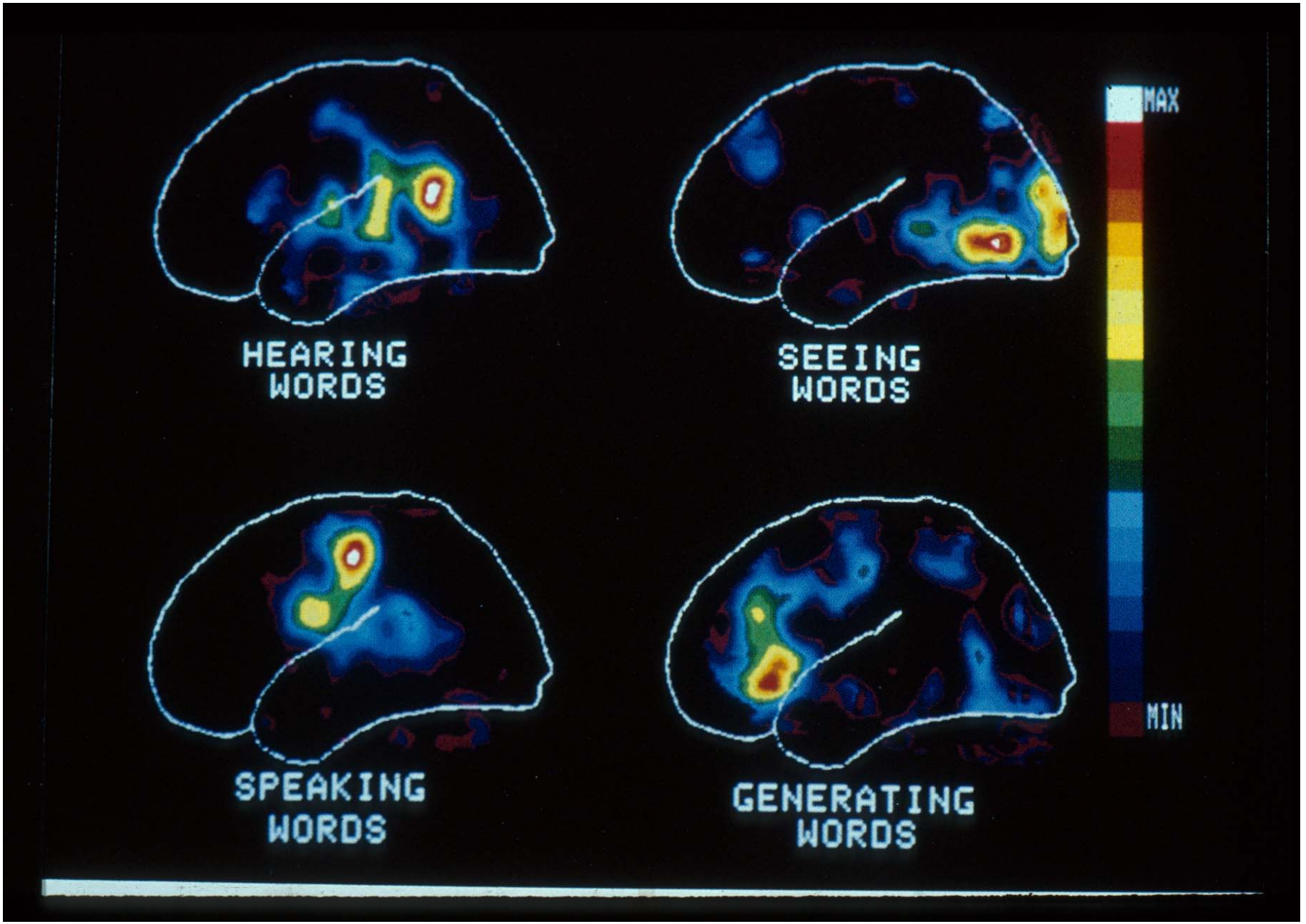
generating verb

RECORDING

PET - Experimental Design

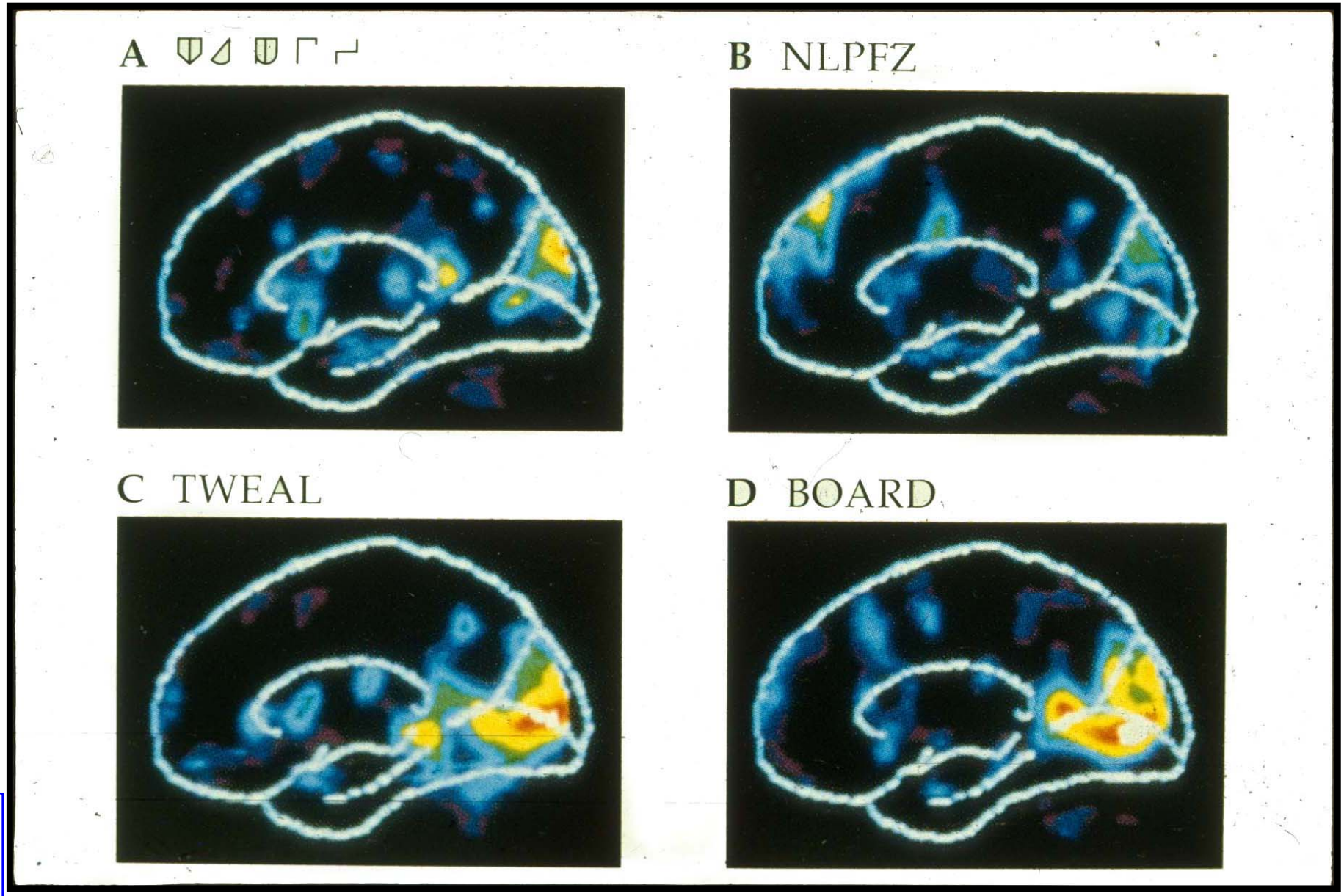


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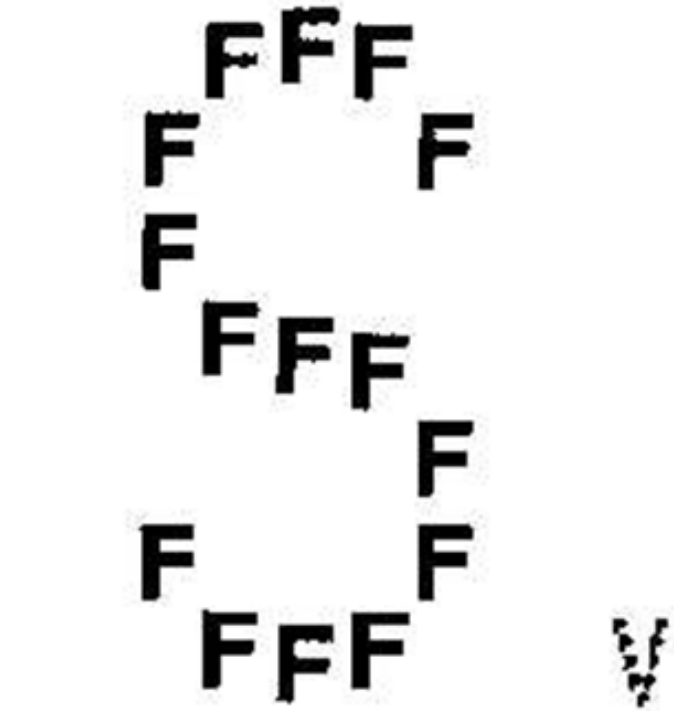


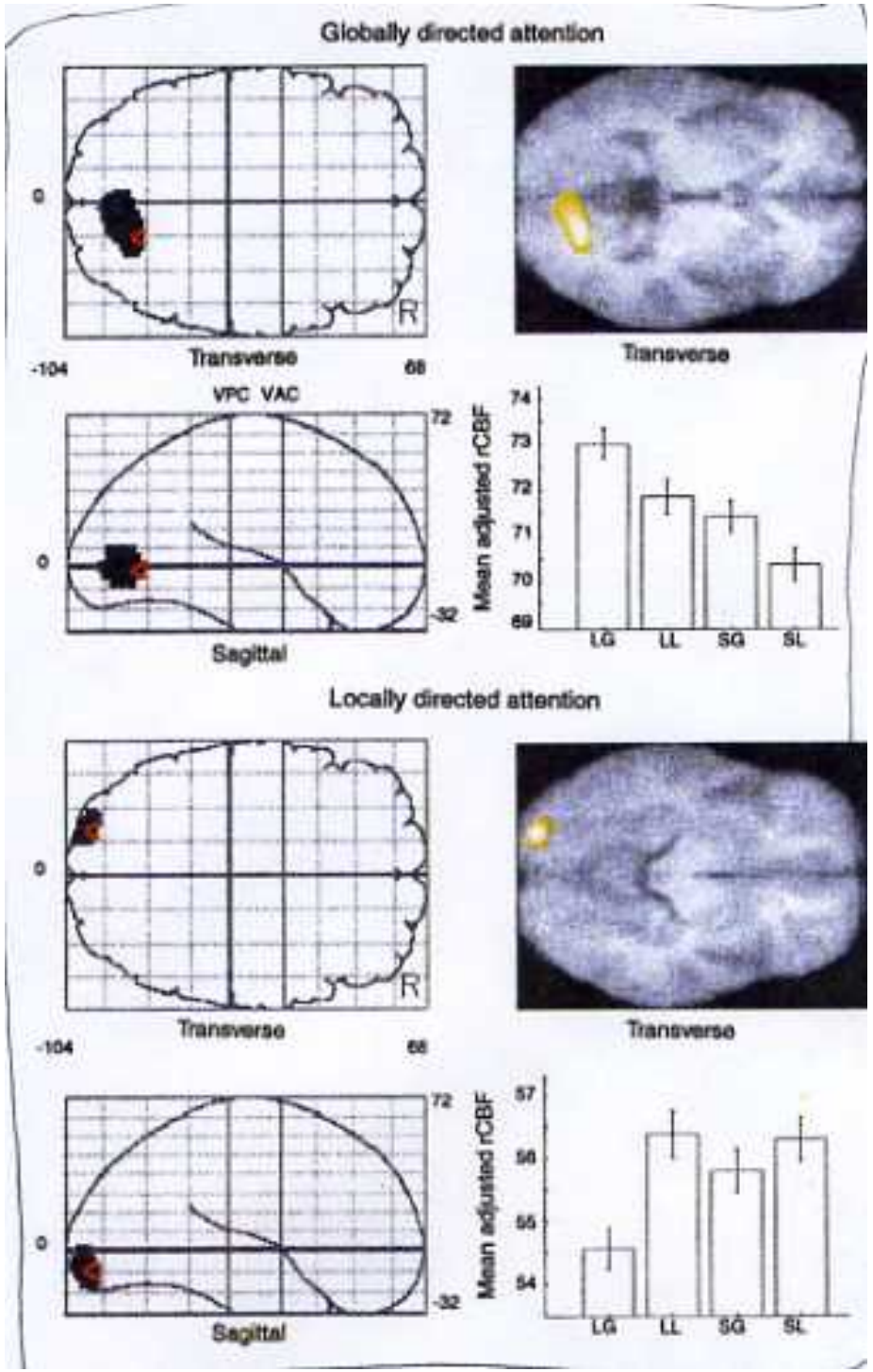
“Seeing a word” = (BOARD) - (+)

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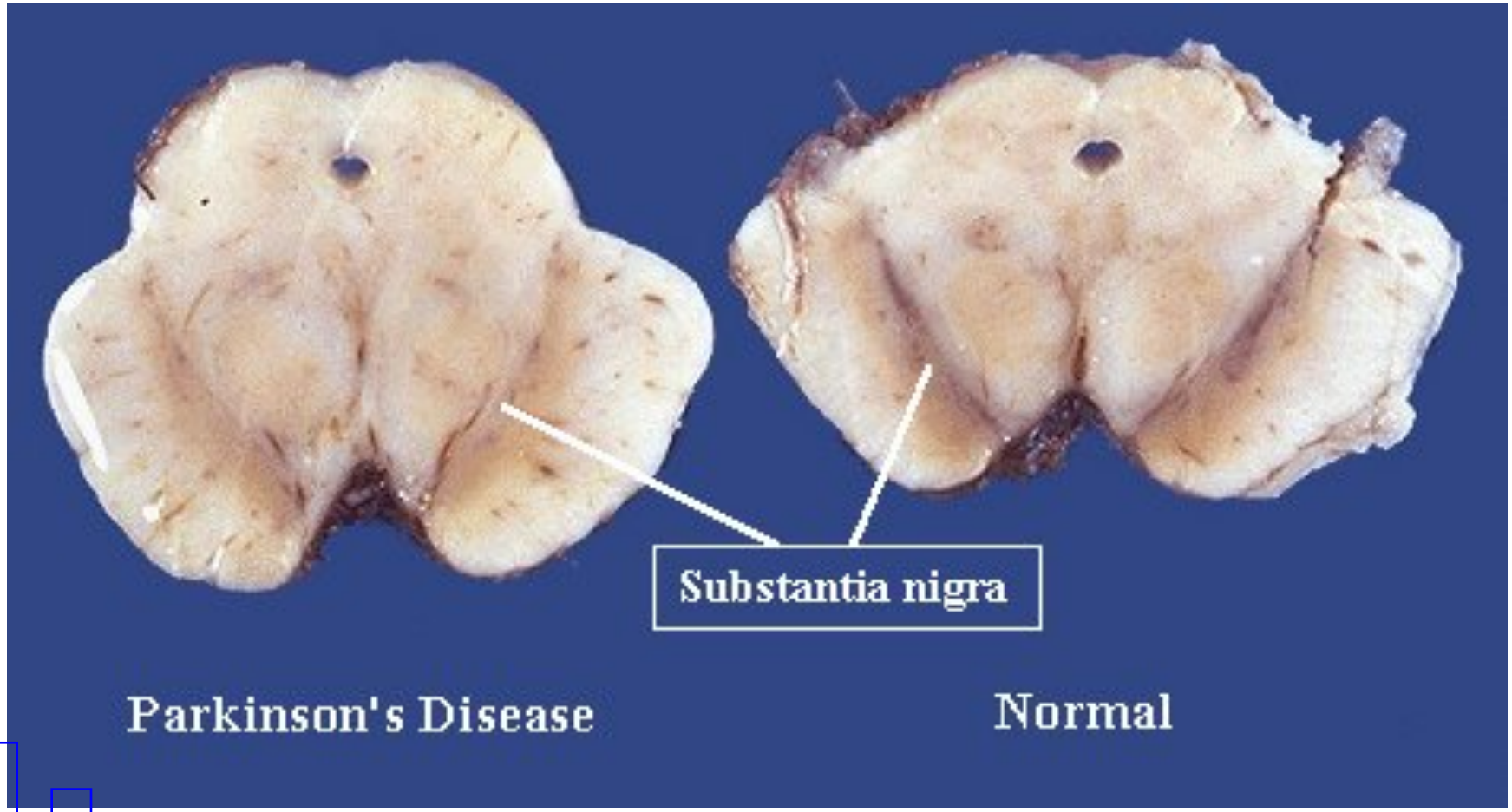
PET – Strengths and Limitations

Strengths

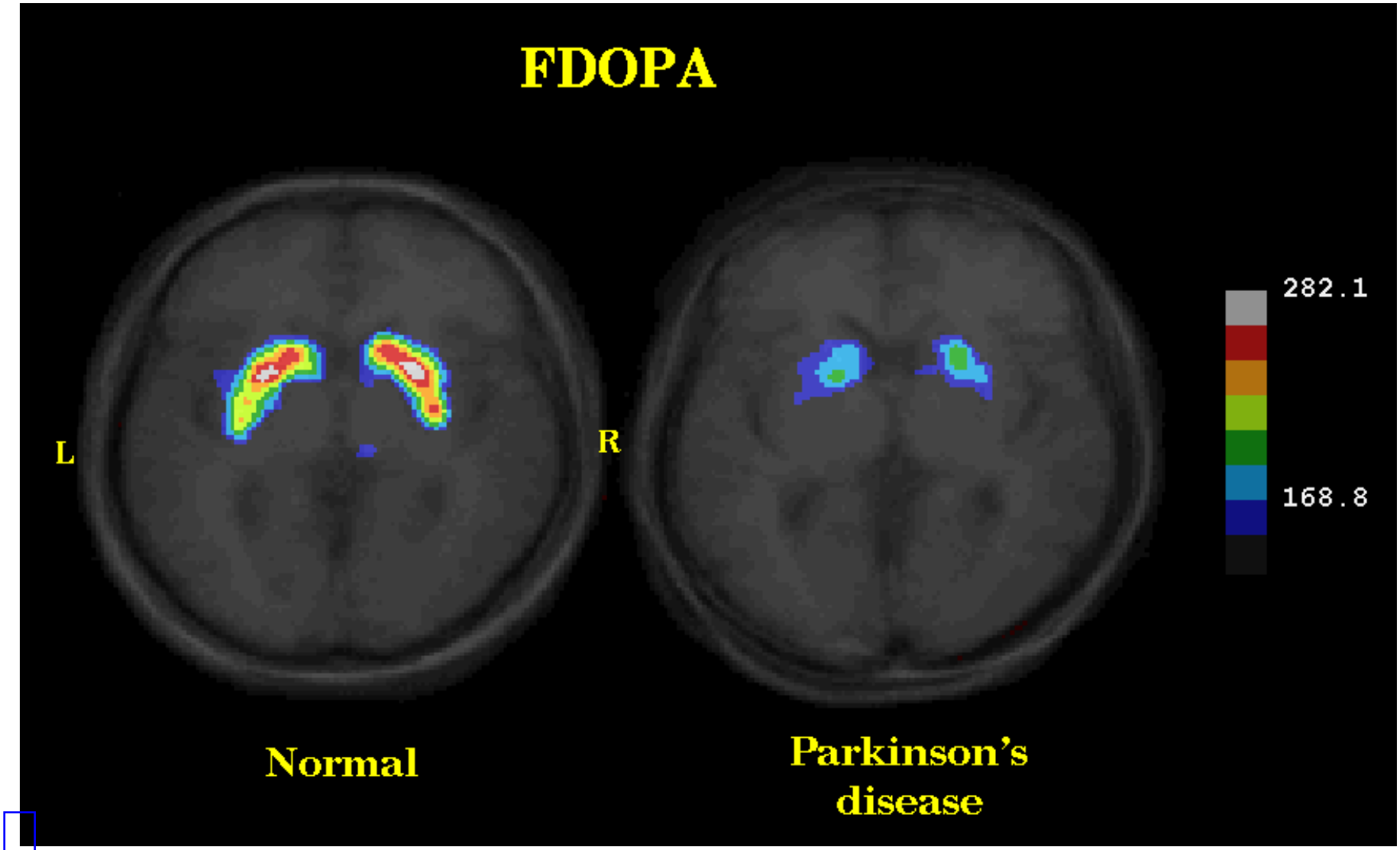
- good spatial resolution (5-10mm); better than ERP/MEG but worse than fMRI

Limitations

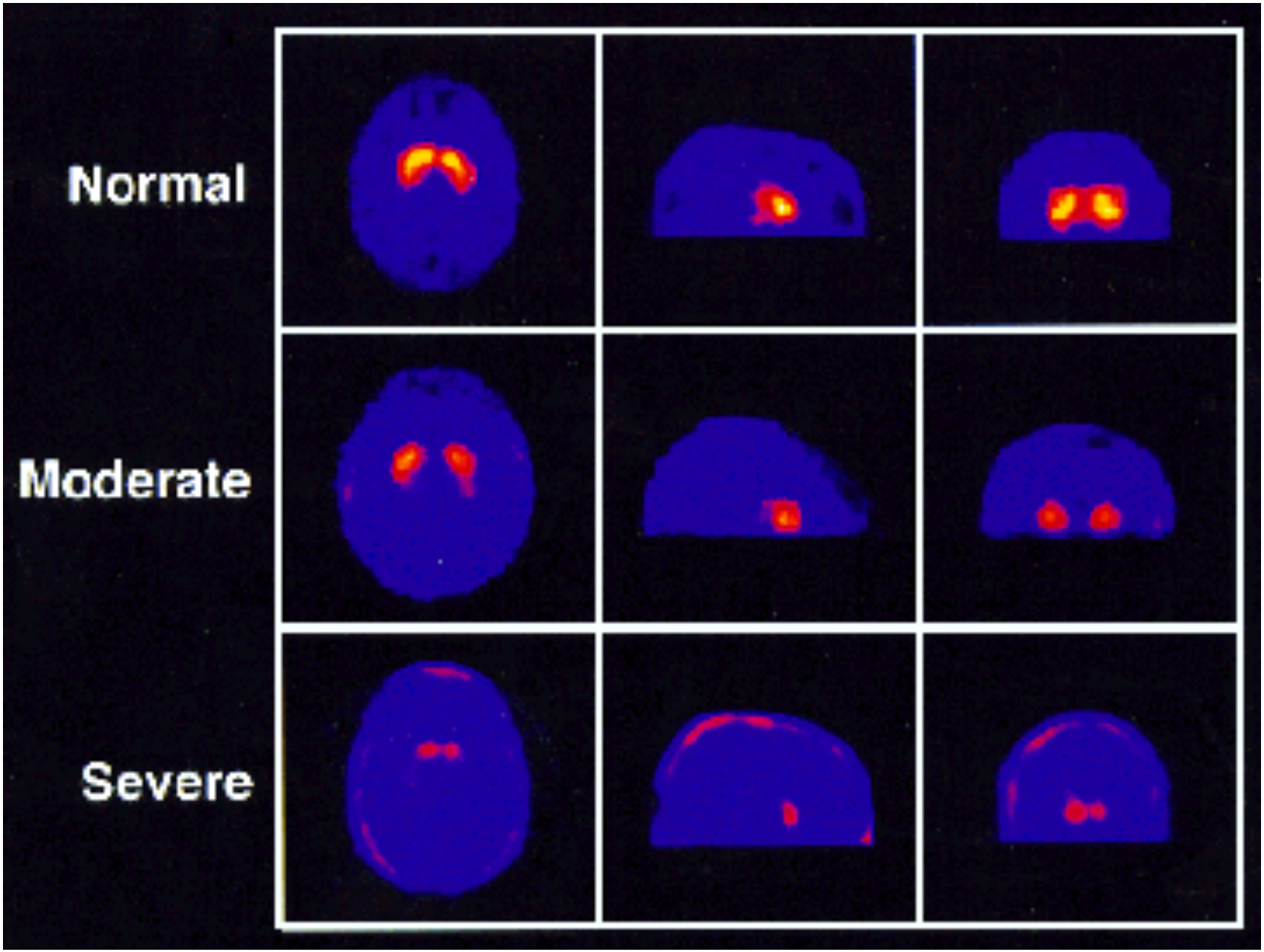
- poor temporal resolution
- extremely invasive (injection of radioactive tracer)
- rare & expensive ($3 million, $700K yearly maintenance)
- correlational (not causal)



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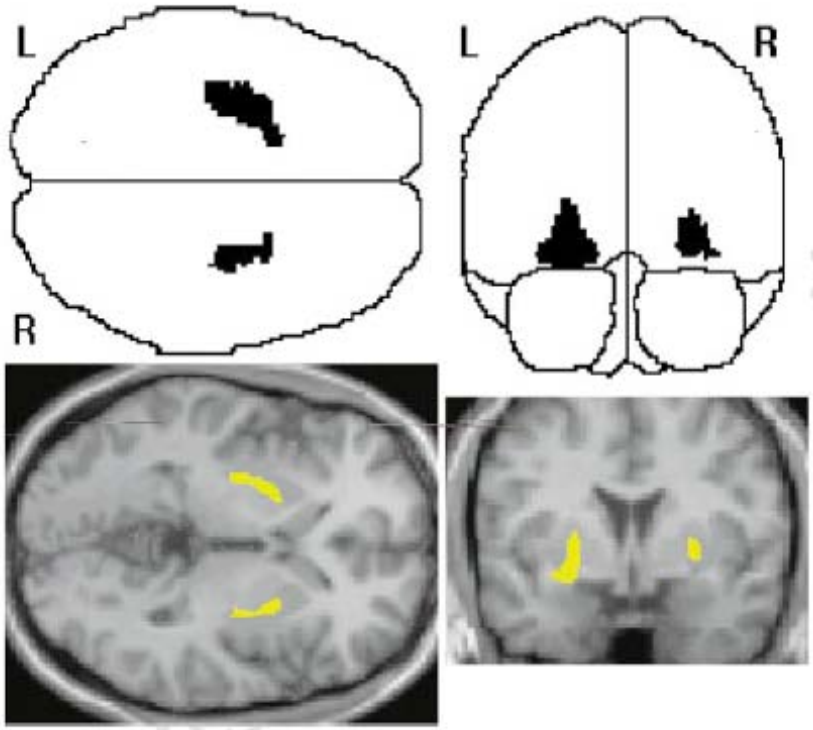


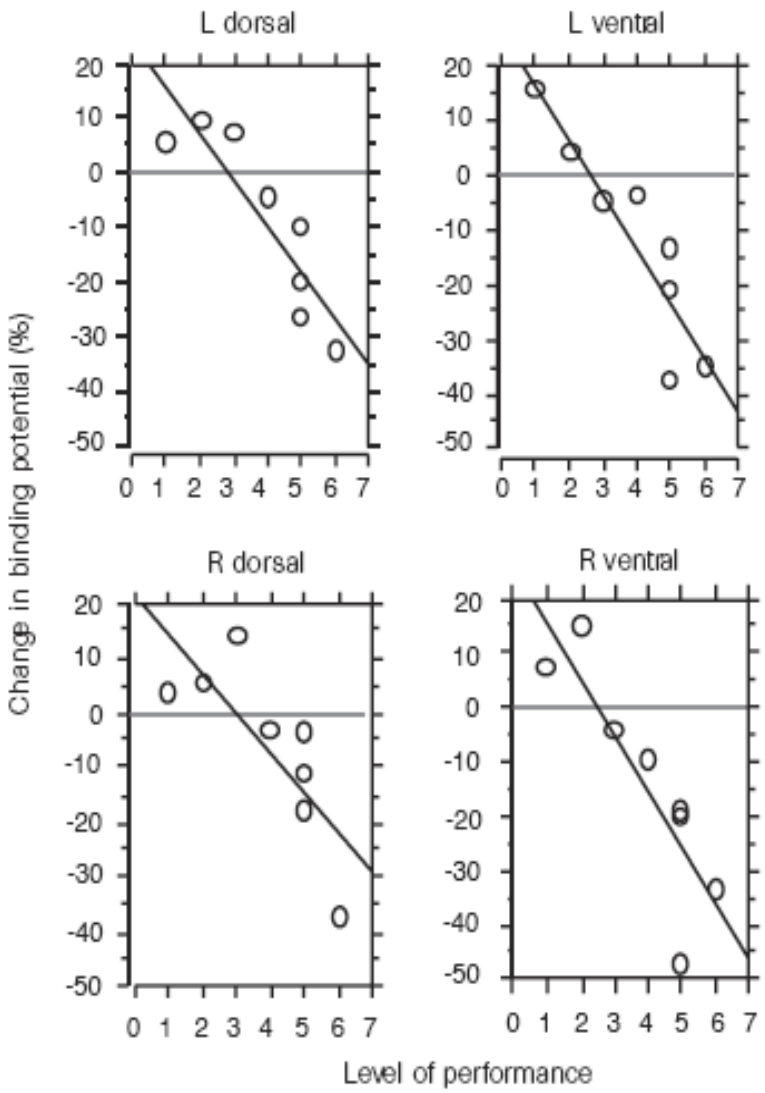
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Parkinson's Disease

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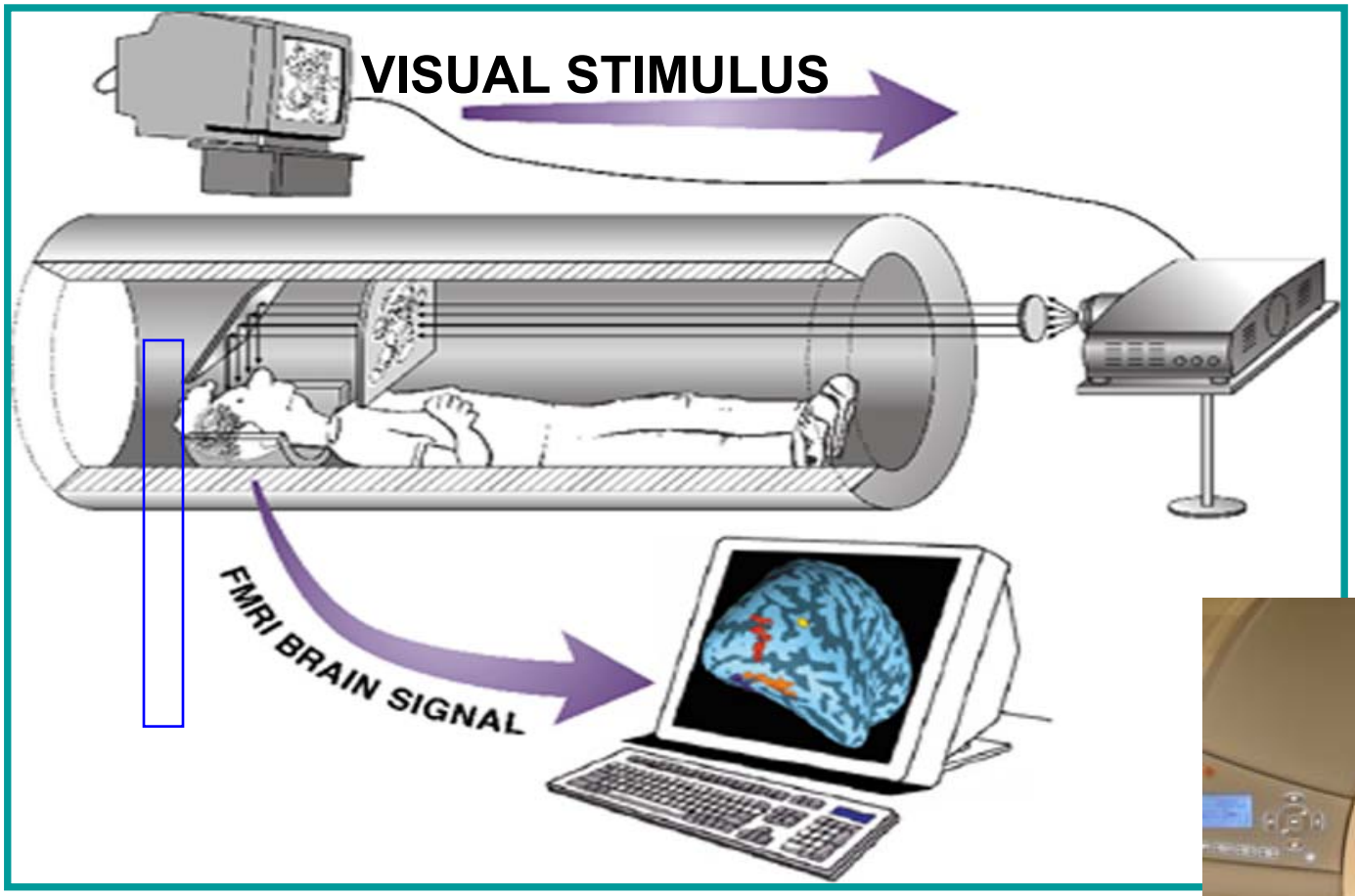


Video games & dopamine

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RECORDING

fMRI



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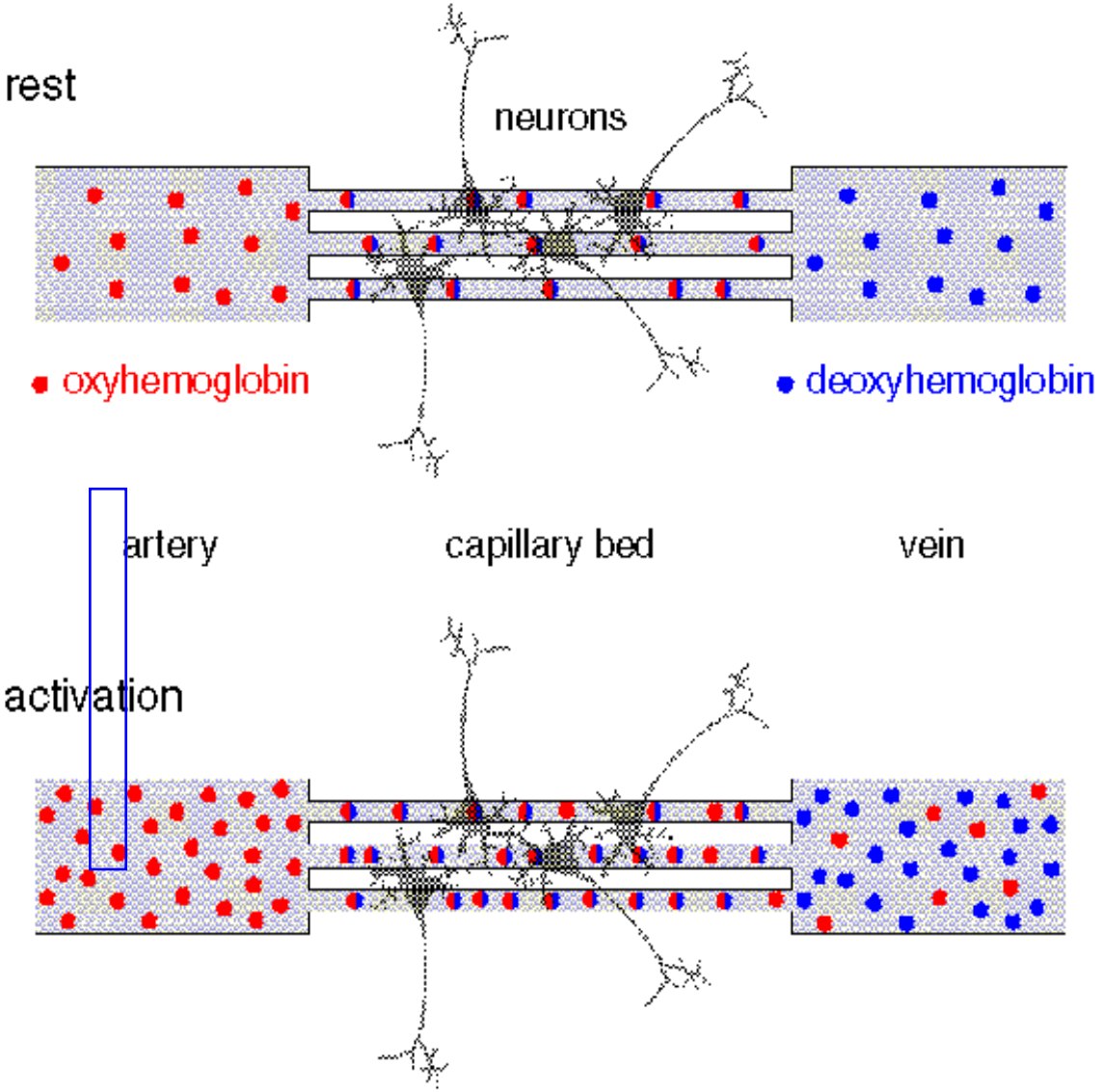
RECORDING

fMRI Principles

- like MRI, take advantage of magnetic properties of molecules
- HOWEVER, focus on hemoglobin
- Hemoglobins are in the blood and carry O_2
- Hemoglobins become deoxygenated when O_2 is absorbed
- deoxygenated hemoglobin more sensitive to magnetic field than oxygenated hemoglobin

RECORDING

fMRI Principles



- increased blood flow to active region

- hemoglobins become deoxygenated as neurons use up the supplies of O_2

- fMRI measures ratio of Oxy:Deoxy

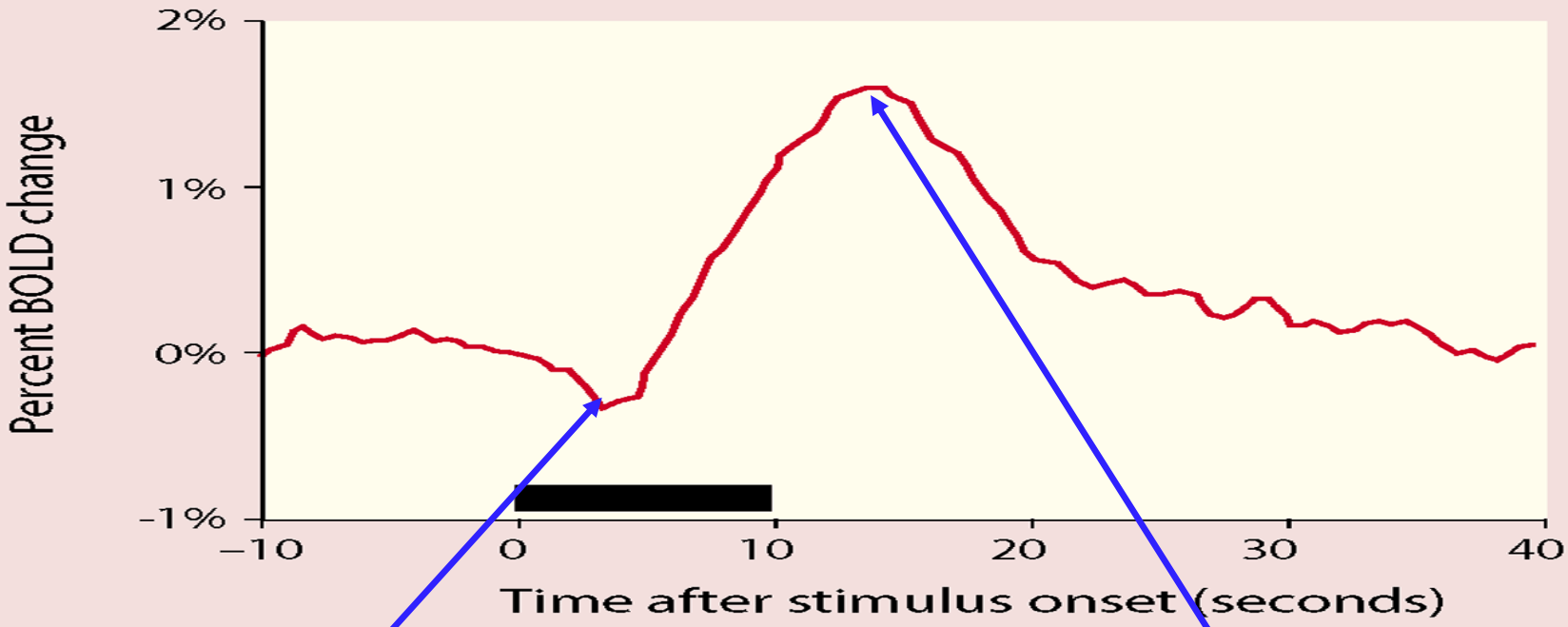
- Blood Oxygenation Level Dependent effect (BOLD effect)

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? If neurons using up oxygen, why does BOLD signal *increase*?

RECORDING

fMRI Principles



- initial dip DOES reflect use of oxygen

- but signal too small to detect

- later rush of blood to area; arteries overcompensates, providing more oxygen than needed - MUCH LARGER SIGNAL

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RECORDING

fMRI - issues

Strengths

- good spatial resolution (2-3mm)
- non-invasive (no injection)
- widely available
- can be used to assess many cognitive tasks

Limitations

- poor temporal resolution (6s, better than PET, worse than ERP/MEG)
- expensive ($4 million, $300-$1000 per scan)
- correlational, not causal

High level social cognition -

Paradigm to study *Empathy*

Observation or imagination of another person in a particular emotional state automatically activates a representation of that state in the observer

(Preston & de-Waal, 2002)

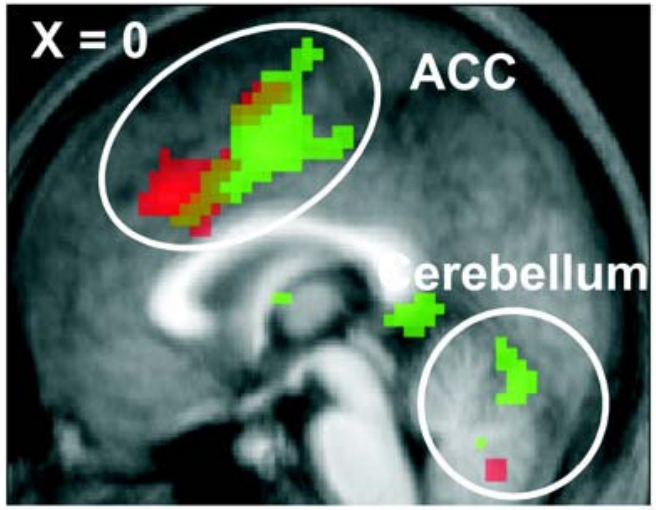
Empathy

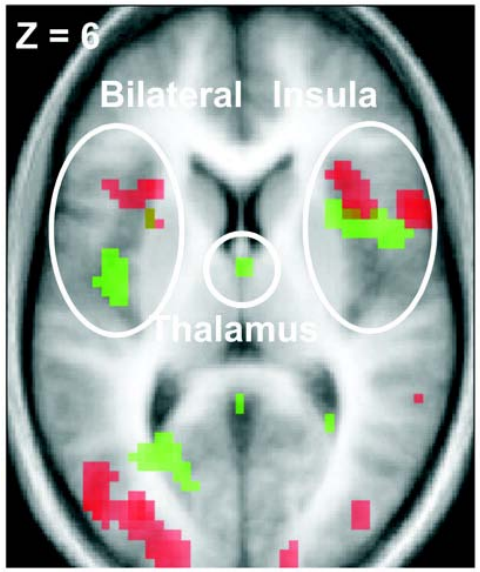
Pain-sensitive activation

Pain > No Pain

"self" *(Experiencing)*

"other" *(Observing one's partner)*





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Trust Games

-*cooperate or defect*?

Ultimatum Game

Two players – split a sum of money

Proposer & Responder

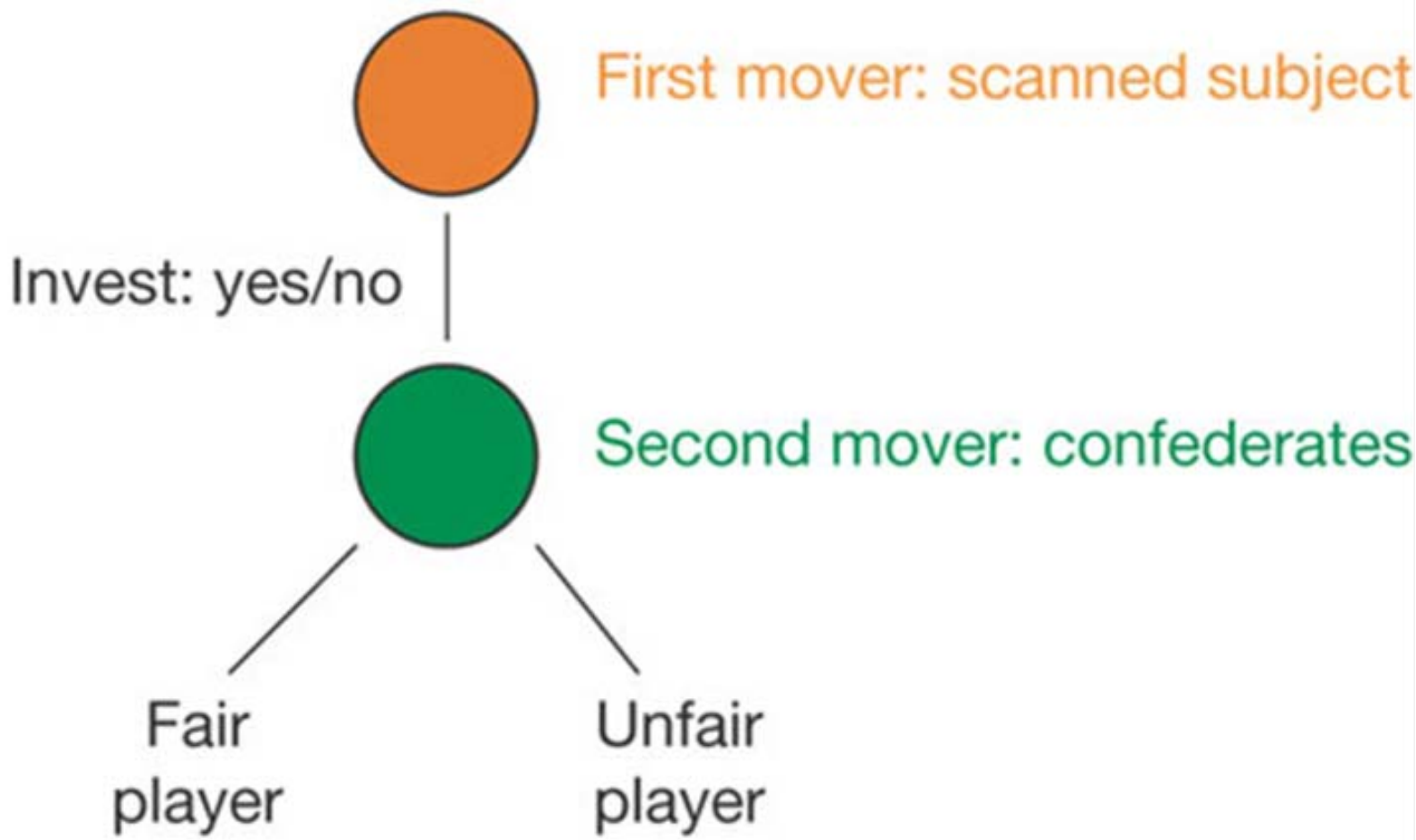
Rejection – no money for anyone

Modal offer – 50%

Low offers (20%) have 50% chance of rejection (fairness)

Empathy

Perceived Fairness of Others



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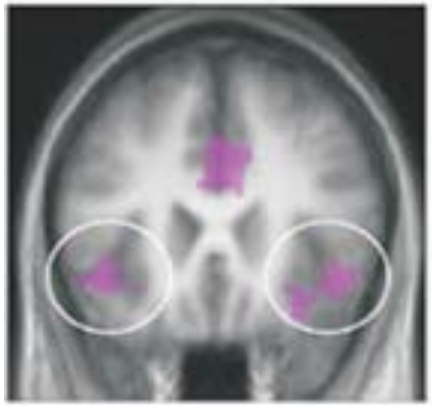
Empathy

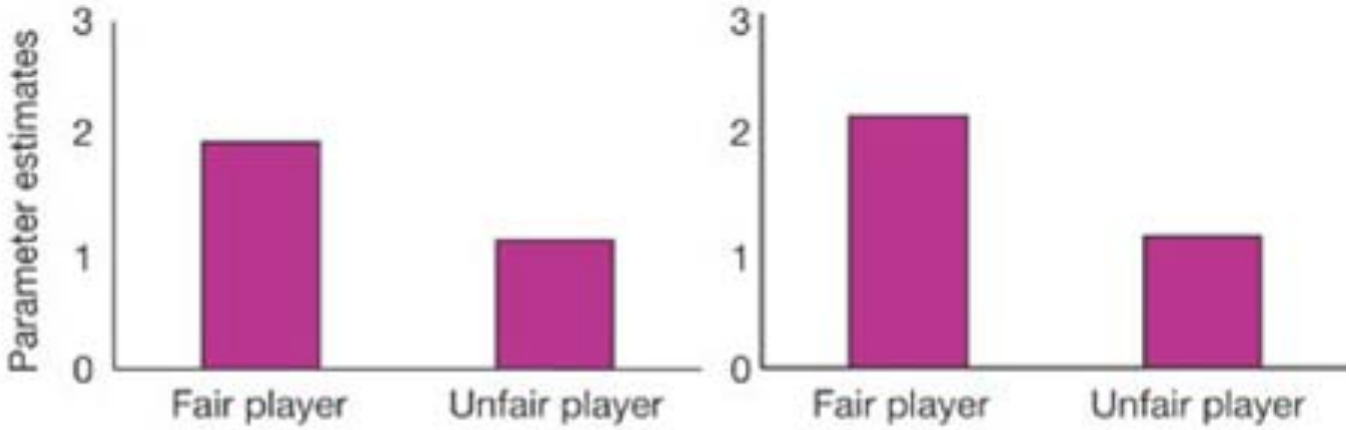
Perceived Fairness of Others

insula

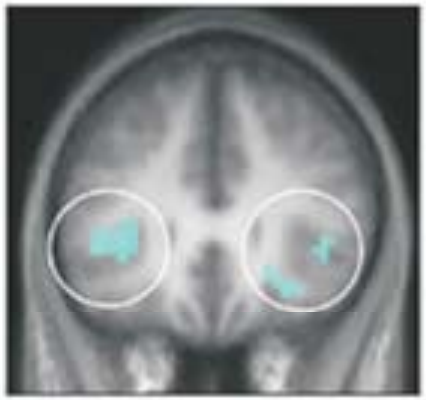
Feeling: Pain > No Pain
Conj.
Seeing other: Pain > No Pain

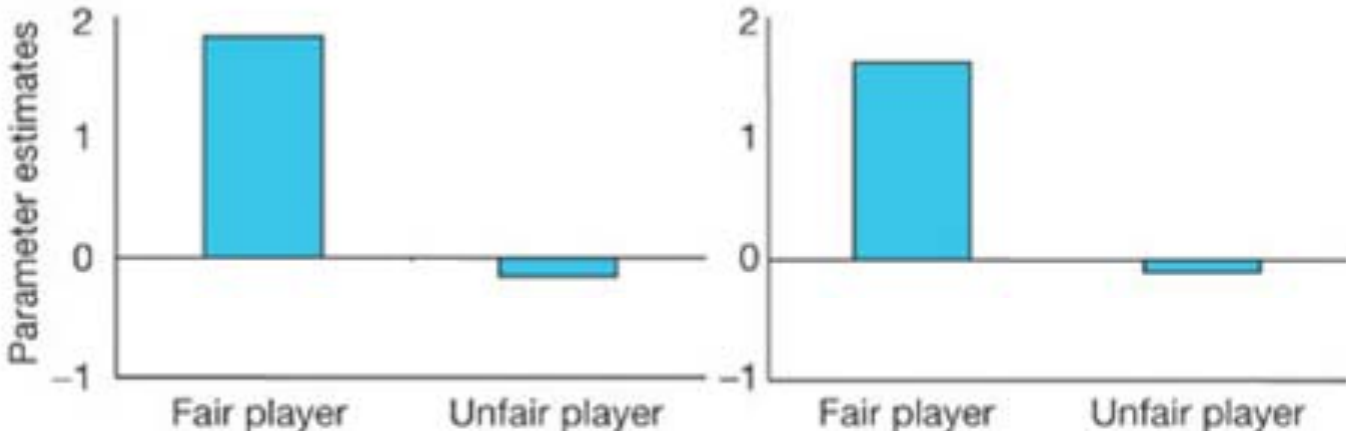
Women





Men





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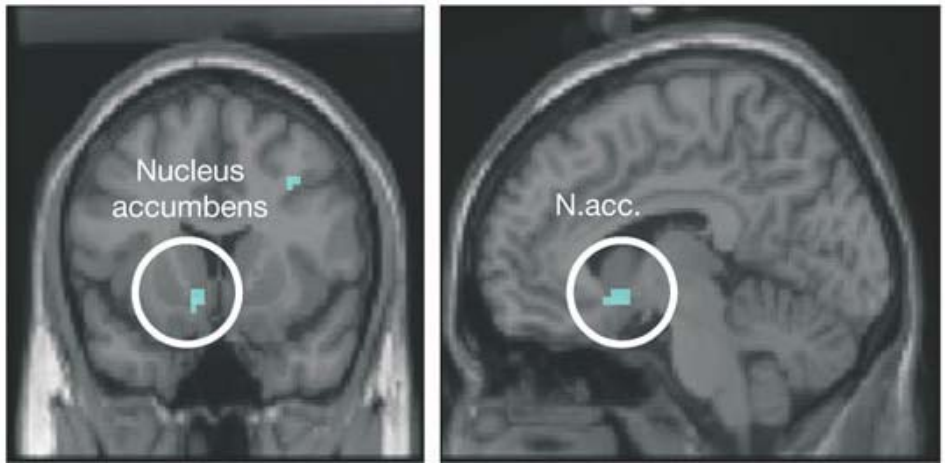
Empathy

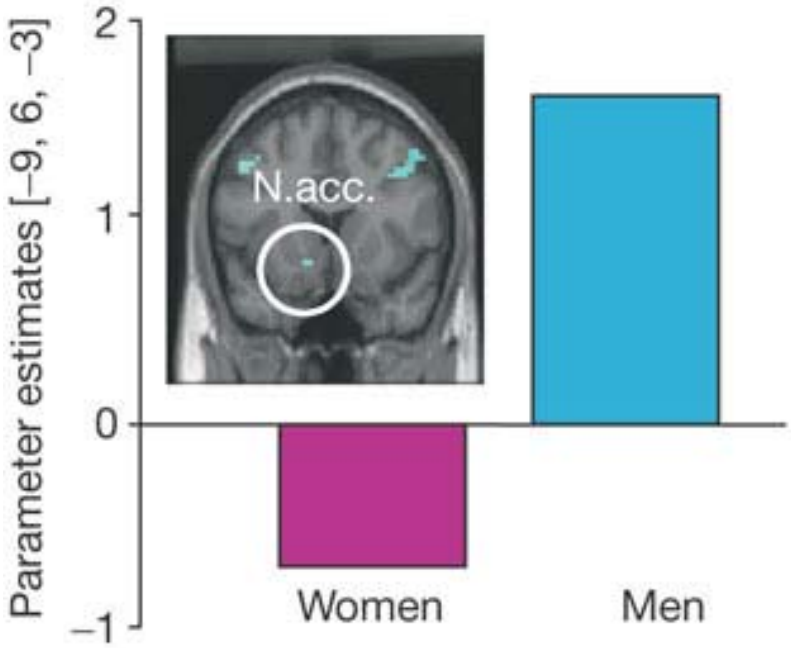
Perceived Fairness of Others – Gender Differences

Nucleus Accumbens

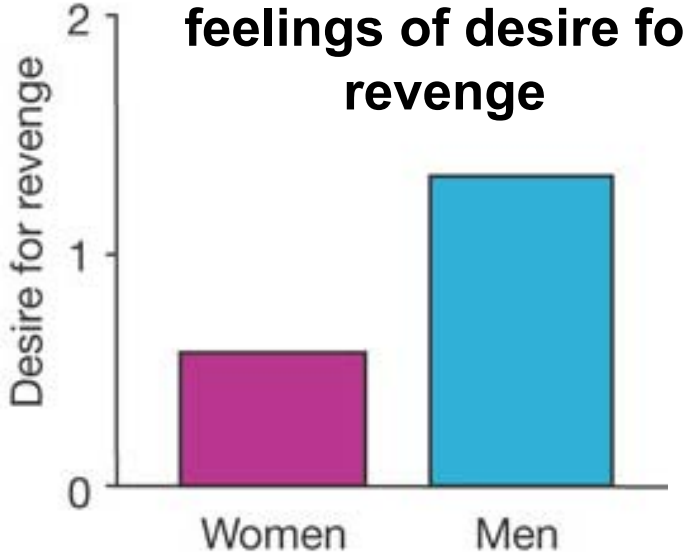
Seeing: Pain Unfair > Pain Fair

Increase in men but not women





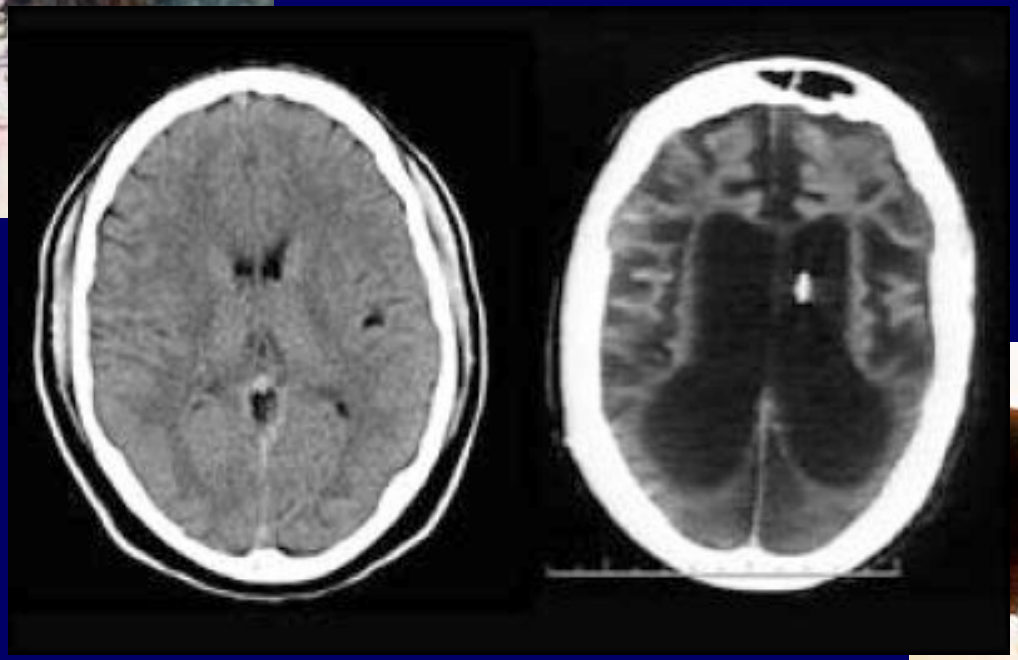
Men indicate stronger feelings of desire for revenge



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Terry Schiavo





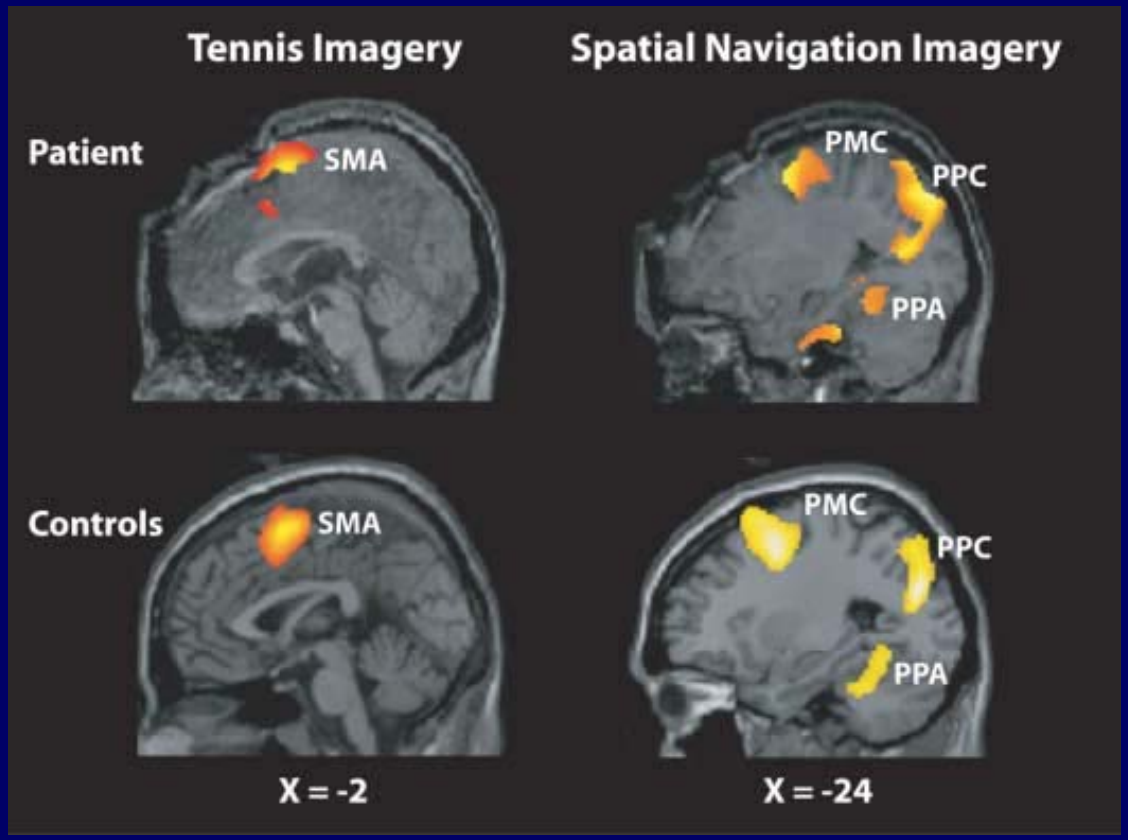
Cardiac arrest Feb 25, 1990; coma, vegetative state; 1998, husband petitioned to remove feeding tube; parents opposed; April 24, 2001 tube removed, but reinserted several days later; many court decisions; President Bush signed legislation to keep her alive; disconnected March 18, 2005 and died March 31, 2005

Photos © AP; CAT scan comparison © Ronald E. Cranford, M.D. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Vegetative State

- emerge from coma, appears to be awake, but no sign of awareness
- 2005, 23 year-old woman, road traffic accident, severe traumatic brain injury, 5 months later unresponsive but preserved sleep-wake cycles
- two mental imagery tests
 - neuroimaging - imagery activates relevant and specific perceptual and memory systems
 - playing tennis
 - visit all rooms of your house, starting with front door

Imagery-Specific Activations



Patient and group of 12 healthy volunteers imagined playing tennis or moving around a house

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Owen et al., Science, 2006

OUTLINE

1) **Lesion**
2) **Stimulation**
3) **Recording**
 - **a. Structure**
 - **b. Function**
 - **i. Electrical/Magnetic**
 - **- EEG**
 - **- MEG**
 - **ii. Metabolic**
 - **- PET**
 - **- fMRI**

Goals: • ***introduce techniques***
• ***present strengths and limitations***

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VISION

John Gabrieli

Melissa Troyer

9.00

Objectives

- **Purposes of vision**
- **Problems that the visual system has to overcome**
- **Neural organization of vision**

Human Perceptual Abilities

- **Detect a candle, 30 miles away, on a dark, clear night**
- **Detect cochlear displacement equal to the width of a hydrogen atom**
- **Taste one teaspoon of sugar even when it is mixed into two gallons of water**
- **Smell a drop of perfume diffused into the space of a three bedroom apartment**

PURPOSES OF VISION

1. OBJECT RECOGNITION

2. NAVIGATION

PURPOSES OF VISION

1. OBJECT RECOGNITION (what)

link a unique image to what we know

objects have many possible versions

- **face - illumination, angle, distance, expression, shadows, occlusion**
- **letters - fonts, handwriting**
- **body - all the ways a person stands**

problems of equivalence **(same shape, different viewing conditions)**

- **size constancy**
- **shape constancy**
- **position constancy**

problems of generalization **(different shape, same object or type of object)**

- **addition or deletion of optional parts**
- **changes in the shapes of parts**
- **changes in spatial relations among parts**

problems of impoverished input **(partial information)**

- **occlusion**
- **poor lighting**
- **multiple eye fixations**

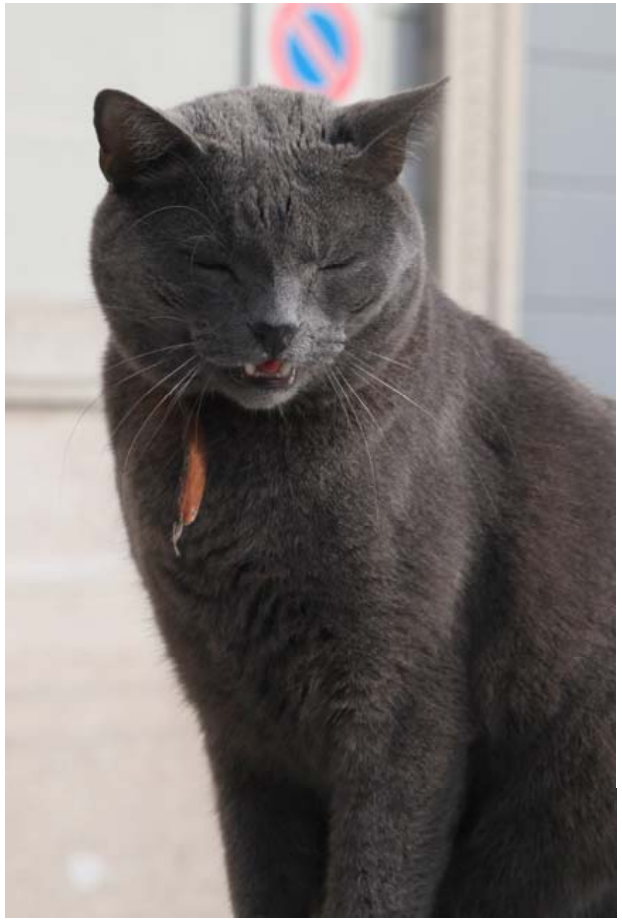
2. NAVIGATION (where)

go through space, track

- **sources of movement - eyes, head, body, objects**

Shape constancy





Photos courtesy of br1dotcomon on Flickr. CC-BY.

Position constancy



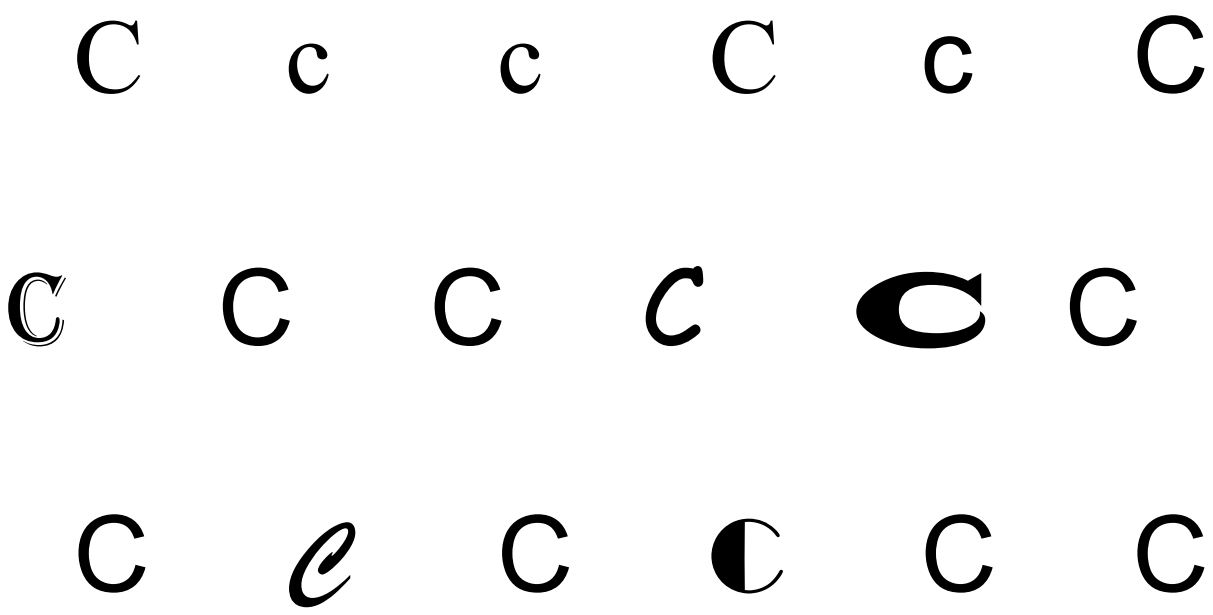






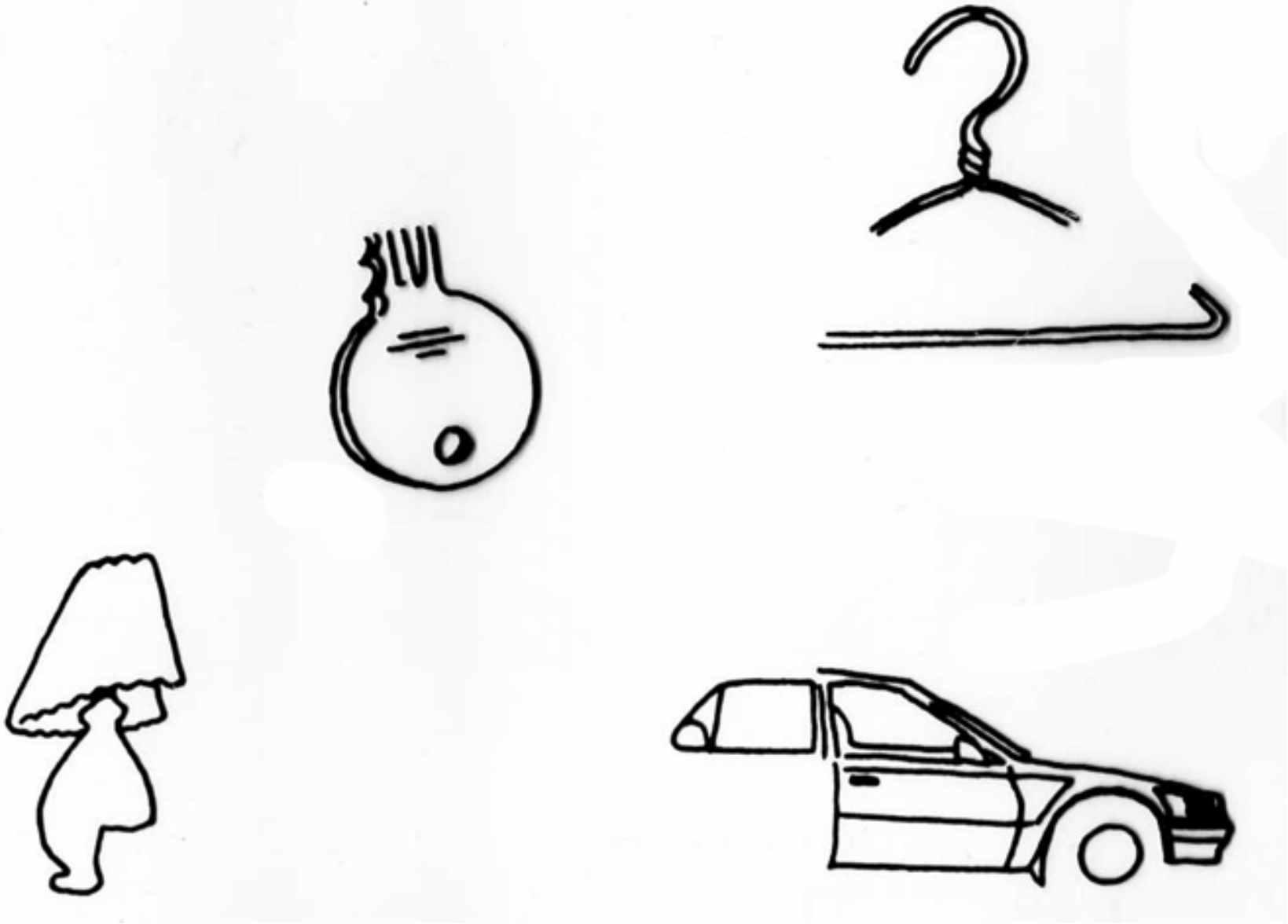
Photos courtesy of Natasha Fadeeva on Flickr. CC-BY-NC-SA.

Problem of generalization



Various representations of C - yet in all cases, we recognize the symbols as C.

Problem of impoverished input



A variety of objects that are missing parts or are partially occluded.

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Perceptual invariance

Image of atypical objects (i.e. a pink elephant, a lined image of Salvador Dali, a plaid apple, and a wooden artist's model) removed due to copyright restrictions.

Vision

- **Seeing**
- **Retina**
- **Cortex**

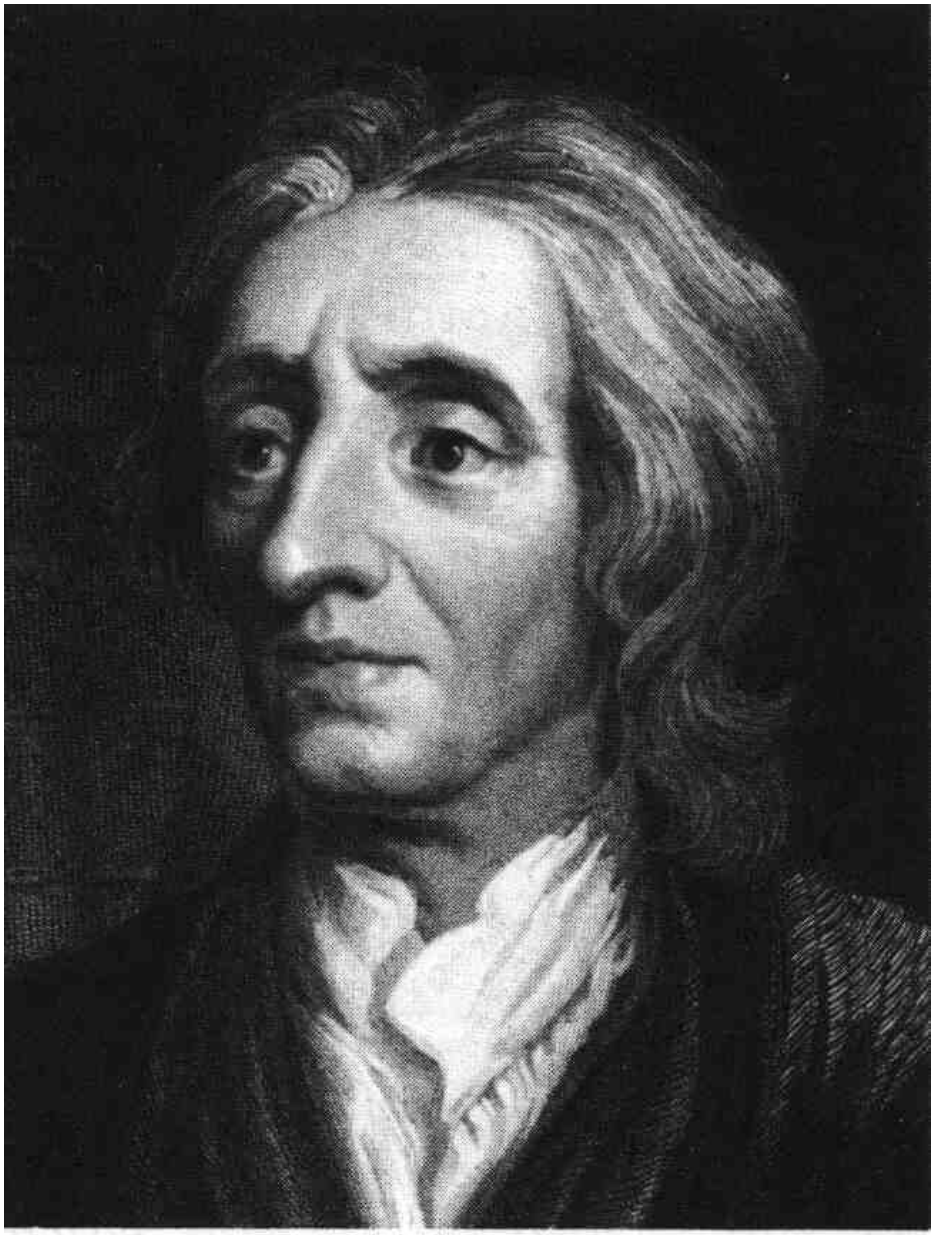
John Locke and Perception

tabula rosa (blank slate)

Let us suppose the mind to be, as we say, a white paper void of all characters, without any ideas: - How comes it to be furnished? Whence comes it by that vast store which the busy and boundless fancy of man has painted on it with an almost endless variety?

Whence has it all the materials of reason and knowledge?

To this I answer, in one word. EXPERIENCE. In that all our knowledge is founded; and from that it ultimately derives itself (Locke, 1690).



Perception

- **Objectivist view ("blank slate" view)**
 - **Our senses precisely, and accurately, reflect the physical world. They provide us with a true, complete, and accurate representation.**
- **Subjectivist view (Gestalt)**
 - **There is no inherent organization to the world, but rather, our brain organizes our perceptions, and we therefore believe the world is, itself, organized.**

Gestalt Principles

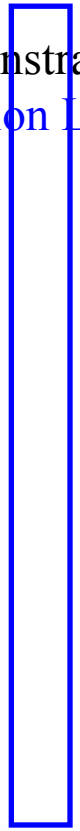
- **In this view, our perceptions may be likened to the output of a piano: these perceptions are evoked by the world, much as the piano melody is evoked by the pianist.**
- **A piano can only emit its own notes – it can't sound like a clarinet. Similarly perceptions are evoked by the world, but they generate experiences limited by the neural structures of our brain.**
- **Our percepts are evoked by nature; but they are personal and not a copy of nature.**

Vision

- **vision is an *interpretation* of the world around us**
- **visual illusions demonstrate the gap between what is out there and how our minds and brains interpret what is out there**
- **illusions are rare because our minds and brains have evolved to have interpretations that almost always work brilliantly in our environment without us having to think about it**

Size Constancy (E.G. Boring)

Photos demonstrating size constancy removed due to copyright restrictions.
See: Perception Lecture: Depth, Size, and Shape.



Grouping

Queen's Jubilee Gift

Goldstein's book, Perception



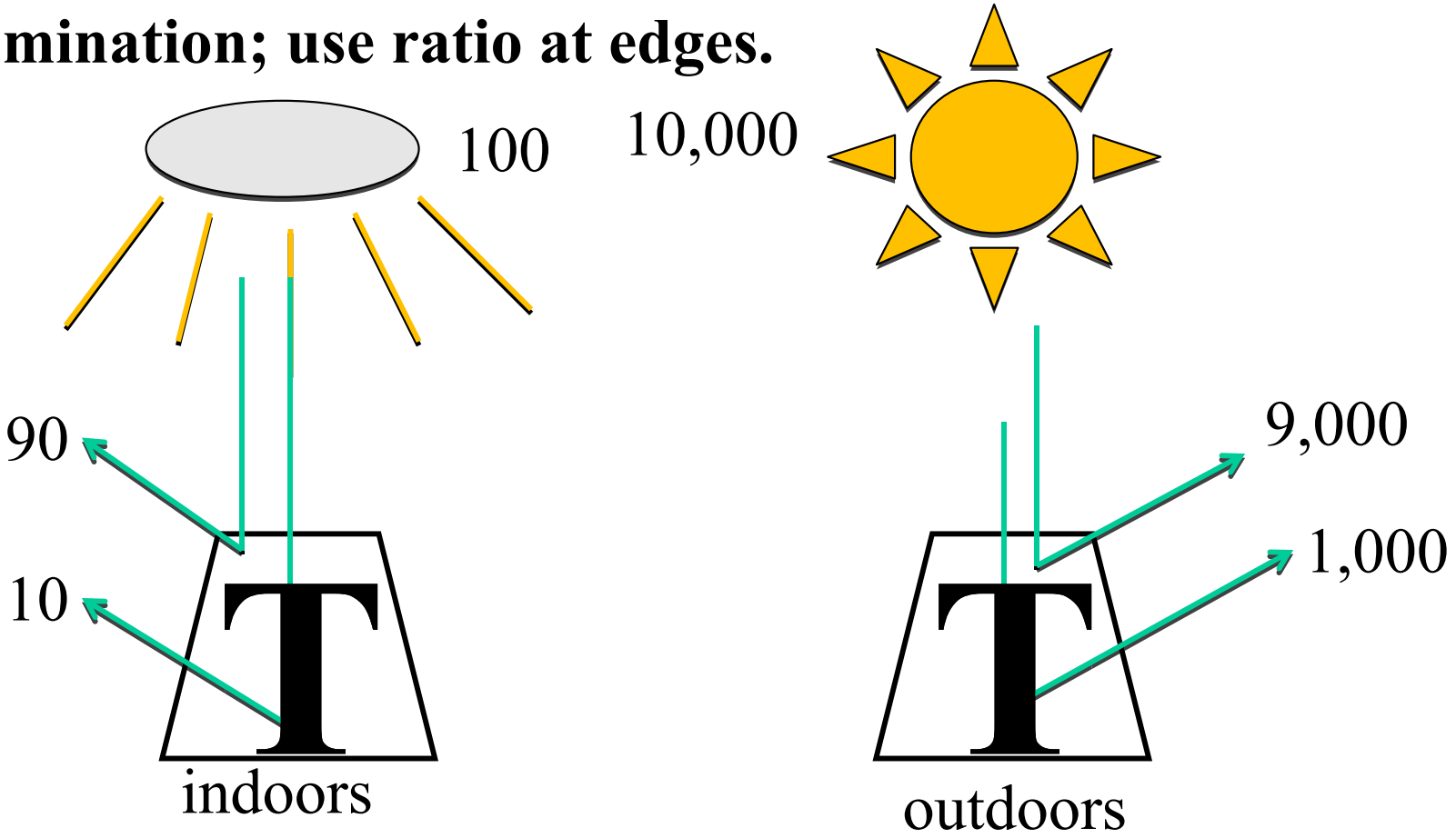
Photo courtesy of solsken on Flickr. CC-BY-NC-SA.

The Problem of Brightness Constancy

- ambient brightness varies greatly
 - outdoor sun, cloud
 - indoor, bright, less bright
 - shadows
 - - piece of coal in sunlight may reflect 10x as much light as snow in the shade
- but we recognize things by their brightness
- so we use unconscious inference to perceive an object's brightness

Hering, Wallach:

Observer simply computes luminance ratios across edges and does not need to perform any high-level analyses about shape or illumination; use ratio at edges.

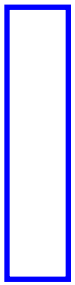


Black "T" is 10x brighter outdoor than white paper indoor

Lightness Perception

(Lotto and Purves)

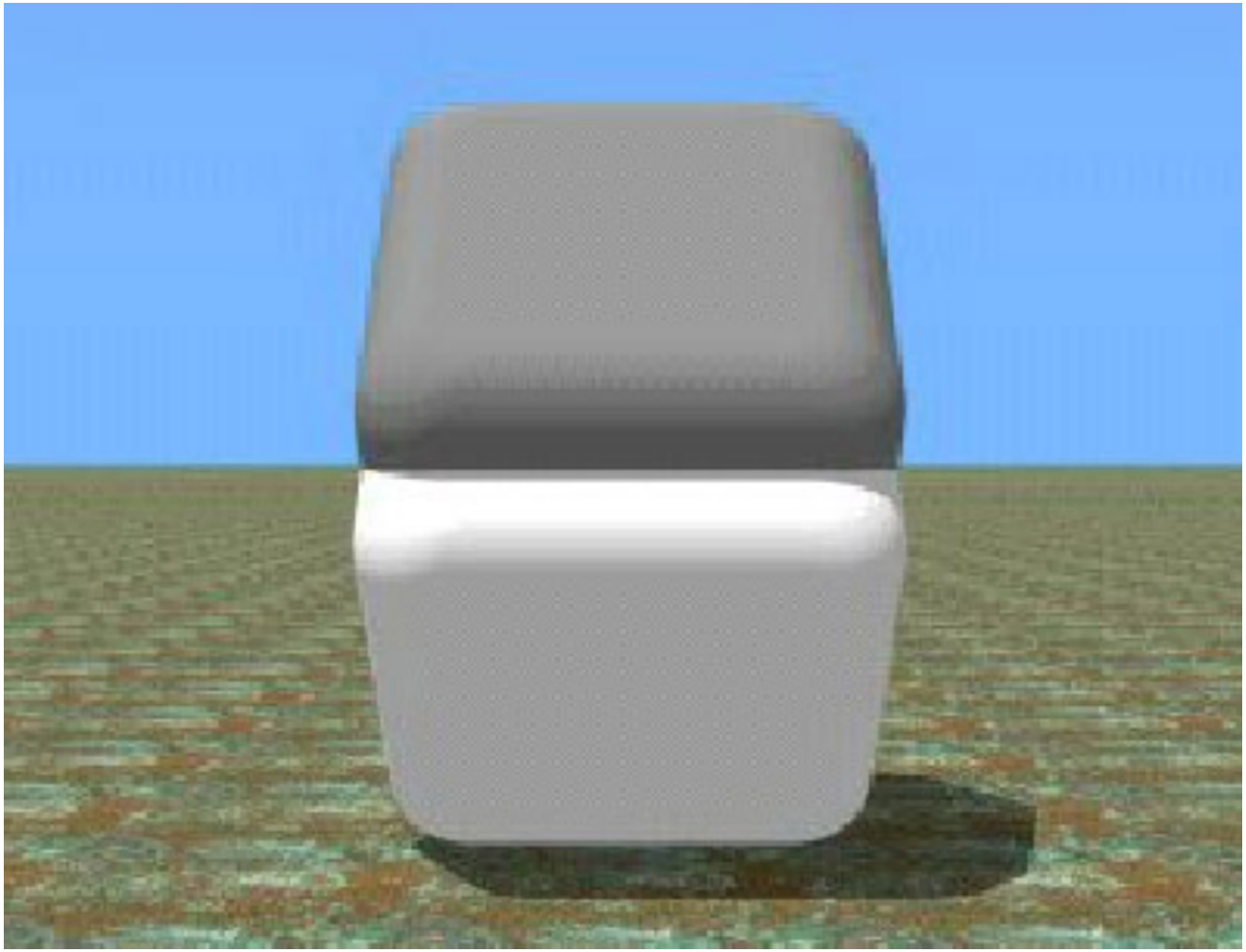
Images removed due to copyright restrictions.
See: handprint.com



Interpretation
The essence of Perception



The perceptual importance of luminance ratios at edges:



Craik-O'Brien-Cornsweet Illusion

Image by R. Beau Lotto at www.lottolab.org. Used with permission.

The perceptual importance of luminance ratios at edges:

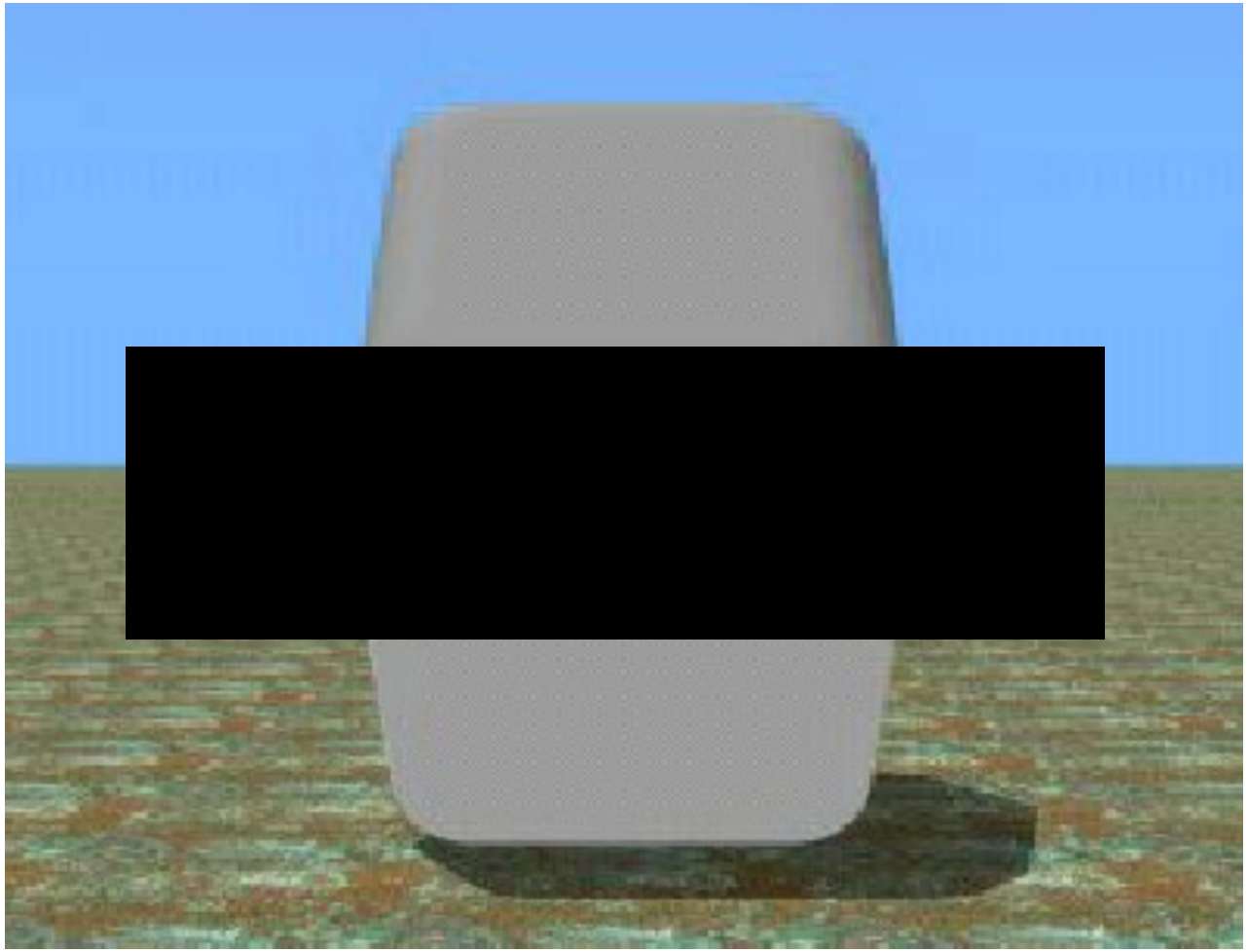
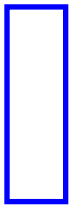


Image by R. Beau Lotto at www.lottolab.org. Used with permission.

Craik-O'Brien-Cornsweet Effect

Additional images of the Craik-O'Brien-Cornsweet Effect removed due to copyright restriction.
See: Wikipedia



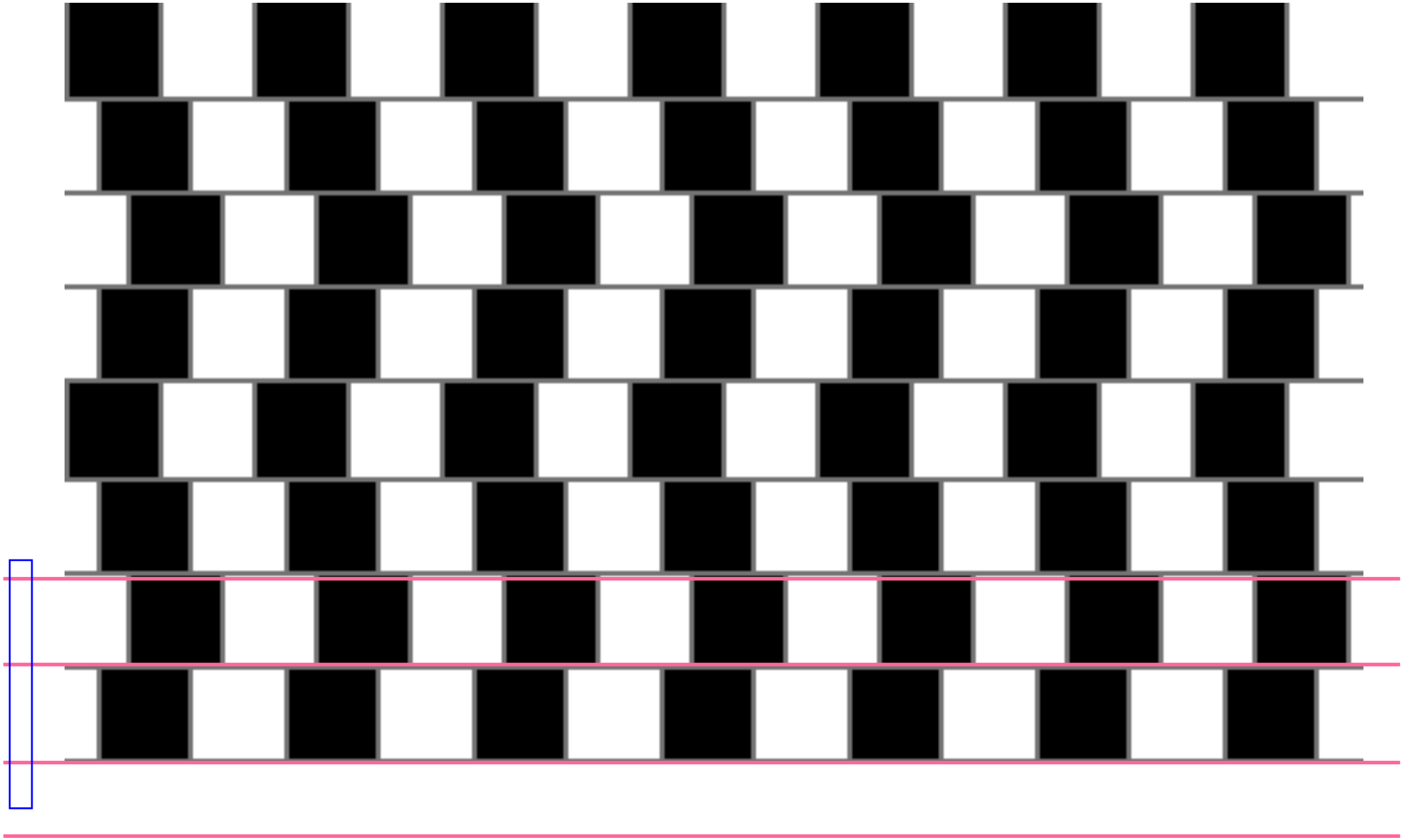
Visual System Interprets Images

Image of Craik-O'Brien-Cornsweet effect from ""Natural image statistics mediate brightness "filling-in," Daxin and Bex, Proc. Roy Soc. (2003), removed due to copyright restrictions.

Some other perceptual illusions

Images of Fraser's Spiral removed due to copyright restrictions.
See: Fraser's Spiral at Michael Bach's "Visual Phenomena & Optical Illusions"

Café Wall Illusion



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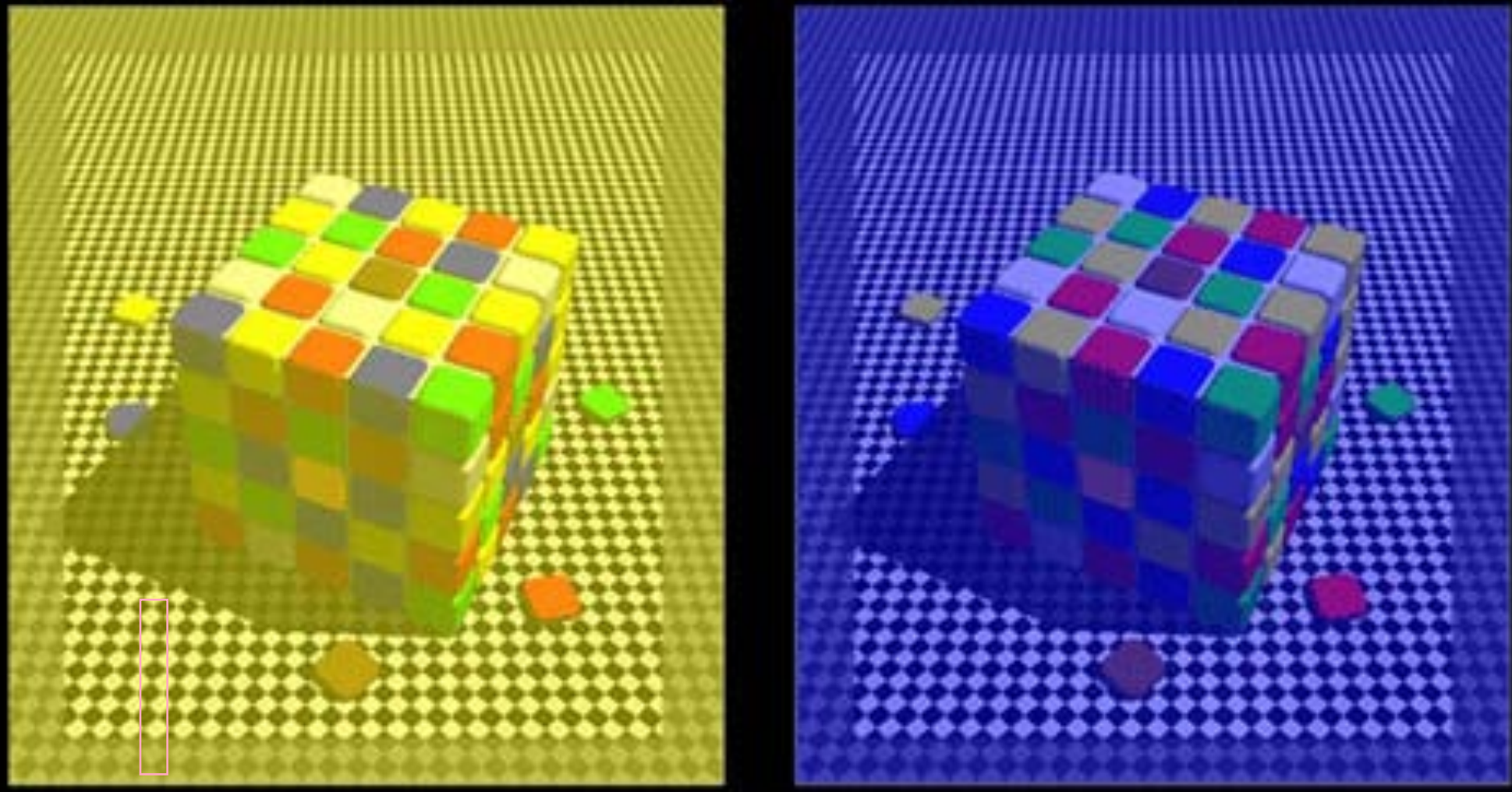
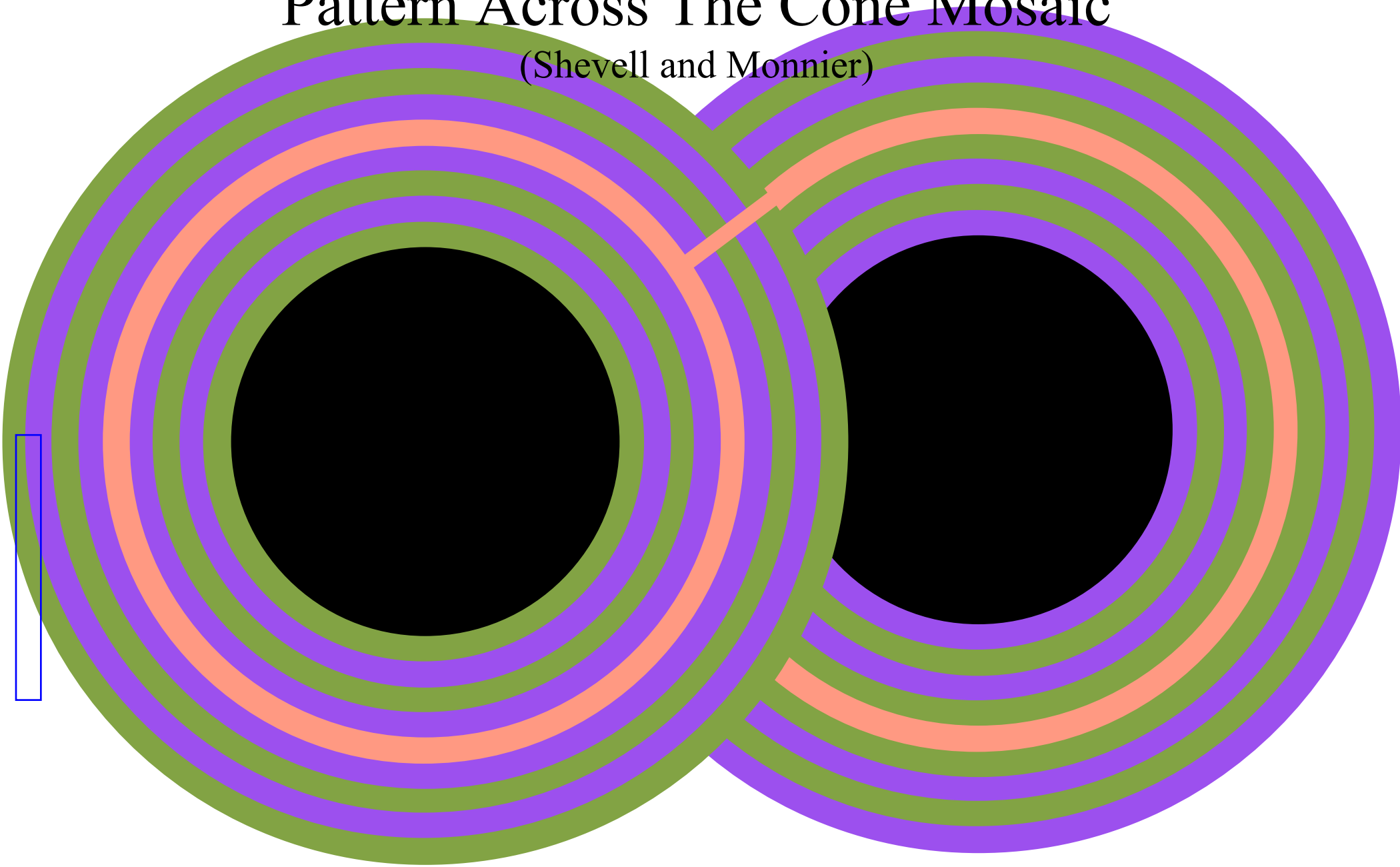


Image by R. Beau Lotto at www.lottolab.org. Used with permission.

Color Appearance Depends On The Spatial Pattern Across The Cone Mosaic

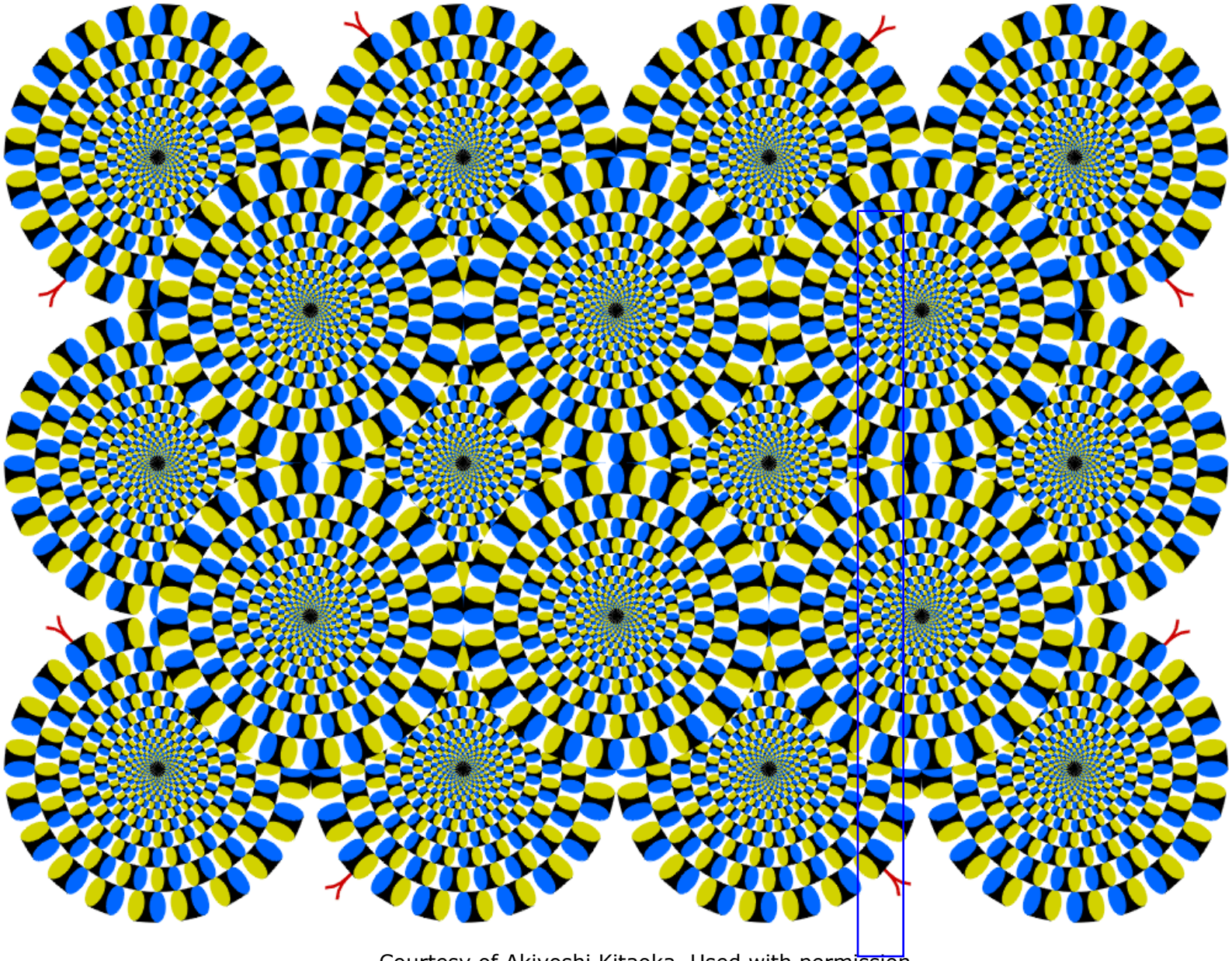
(Shevell and Monnier)



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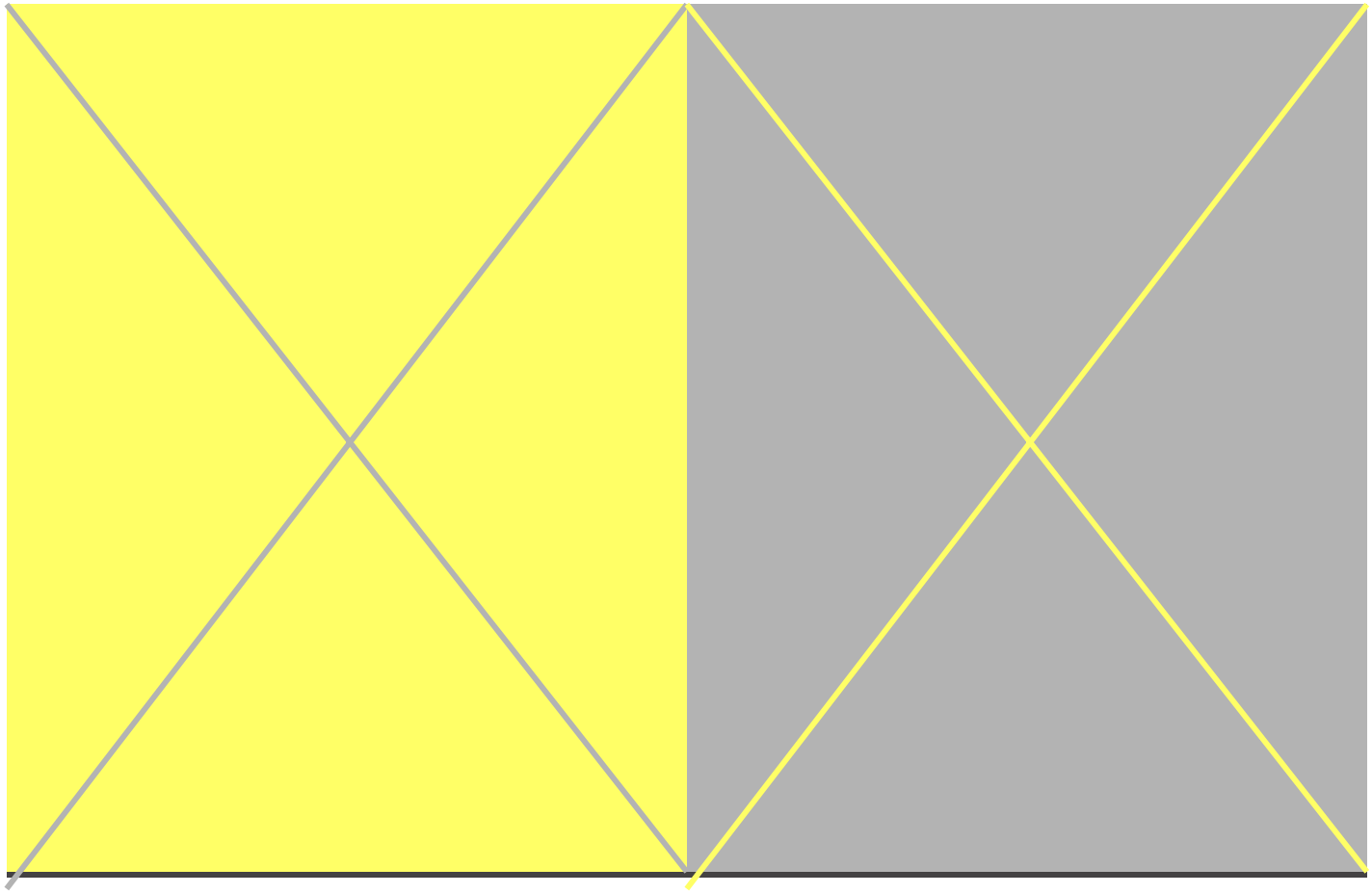
Illusory Motion

http://www.ritsumei.ac.jp/~akitaoka/saishin-e.html



Courtesy of Akiyoshi Kitaoka. Used with permission.

Albers



Perception: Our Approach

- **Objectivist view ("blank slate" view)**
 - **Our senses precisely, and accurately, reflect the physical world. They provide us with a true, complete, and accurate representation.**
- **Subjectivist view (Gestalt)**
 - **There is no inherent organization to the world, but rather, our brain organizes our perceptions, and we therefore believe the world is, itself, organized.**
- ***Synthetic view***
 - **The world appears to us the way it does because:**
 (1) We perceive only within the limits of our nervous system
 (2) Our nervous system has evolved to reflect portions of the world very accurately.

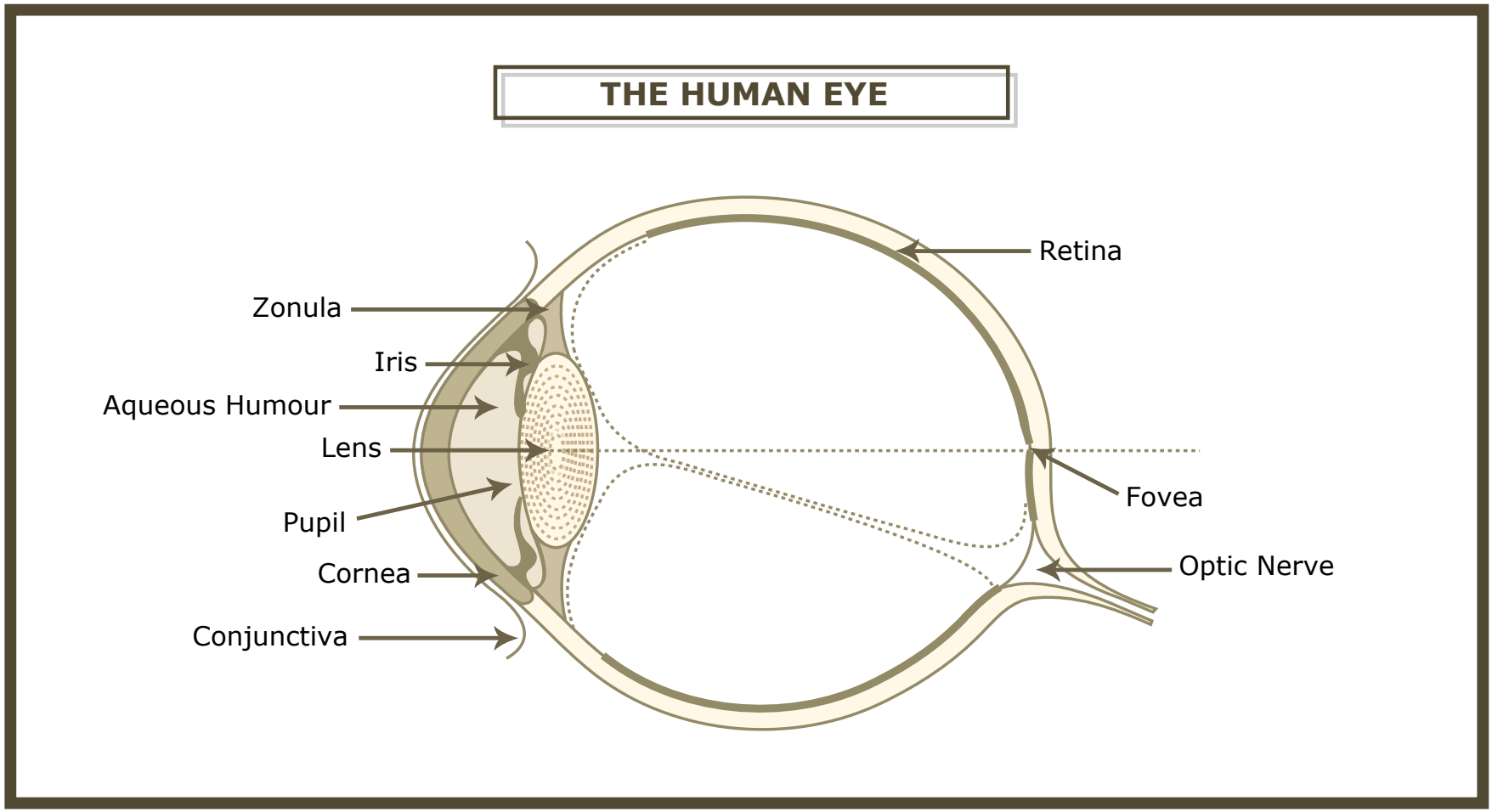


Image by MIT OpenCourseWare.

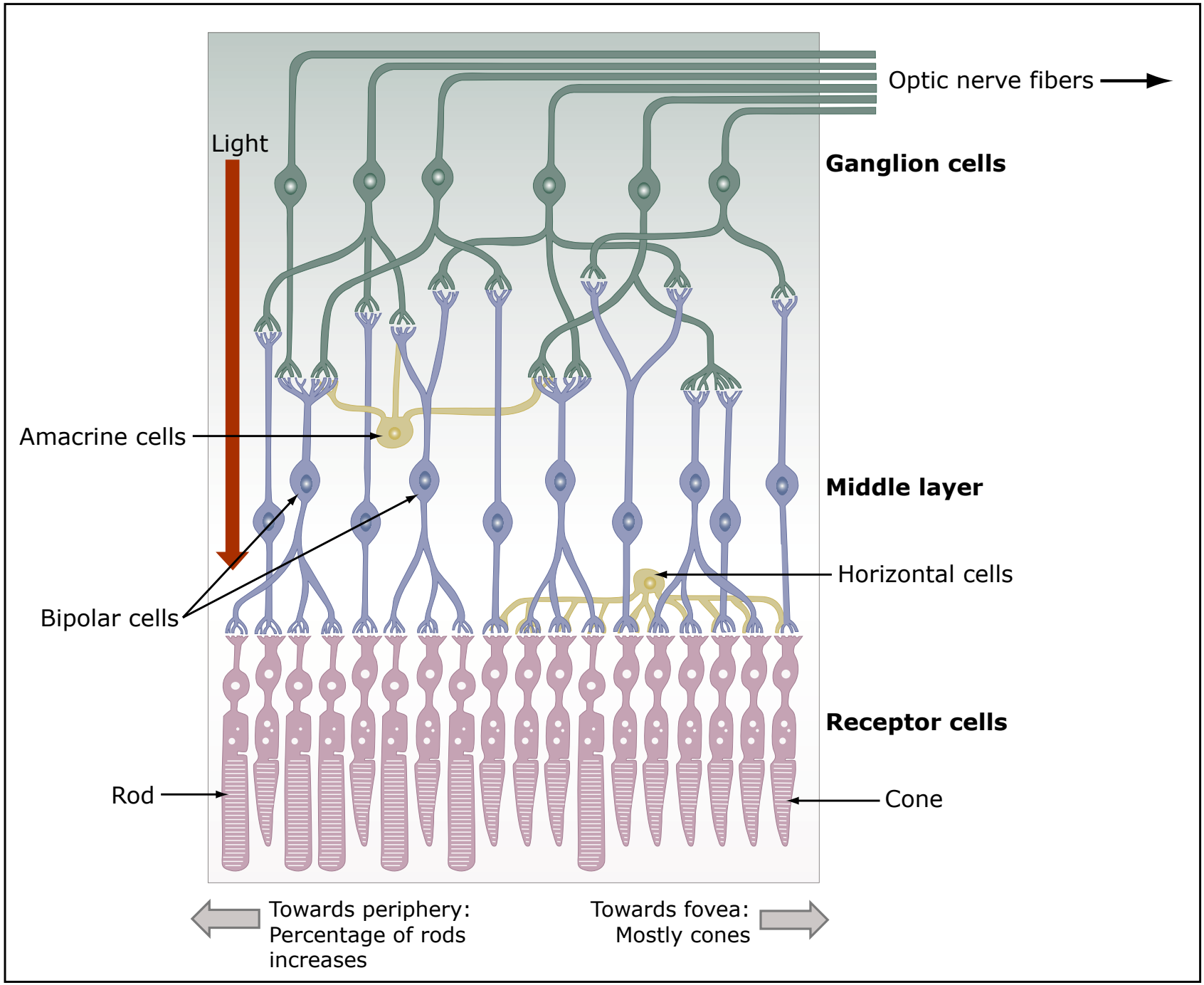


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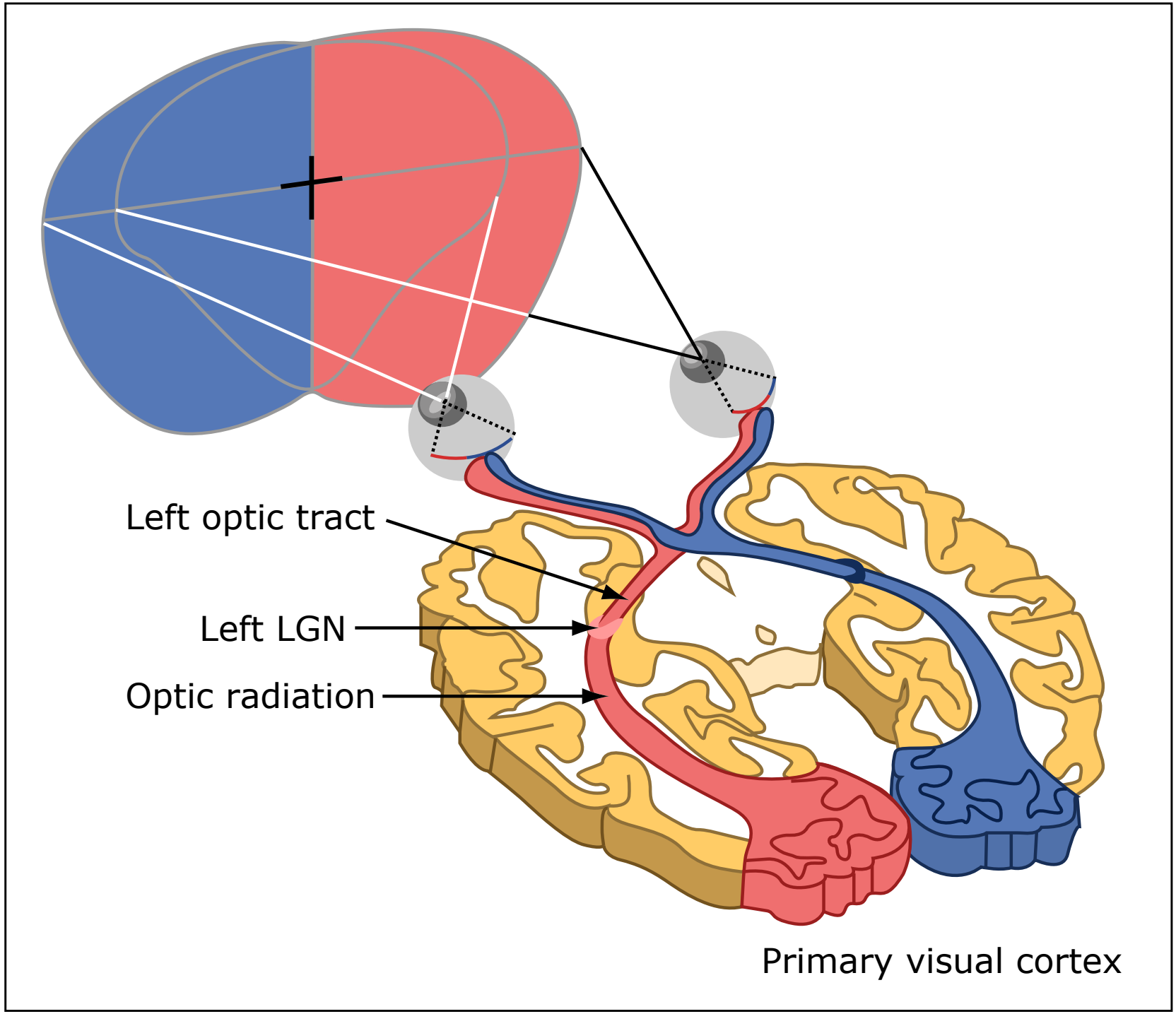


Image by MIT OpenCourseWare.
After Figure 10-4b in Bear, Mark F., Barry W. Connors, and Michael A. Paradiso. *Neuroscience: Exploring the Brain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins, 2007. ISBN: 9780781760034.

Rods and Cones

http://webvision.med.utah.edu/photo1.html

Rods and cones seen through a scanning electron microscope. Each rod is about one micron across.



Spatial Distribution of Receptors

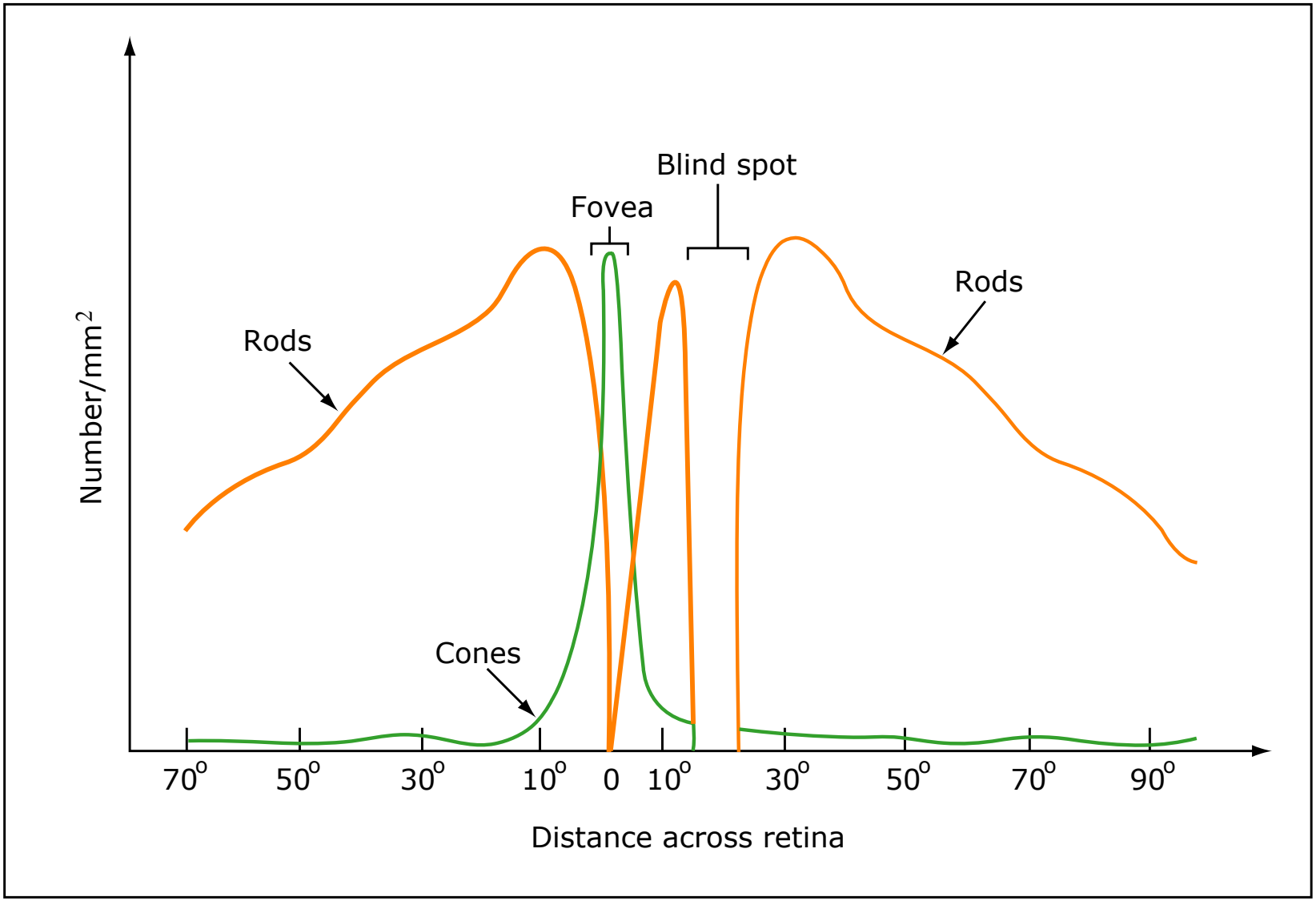


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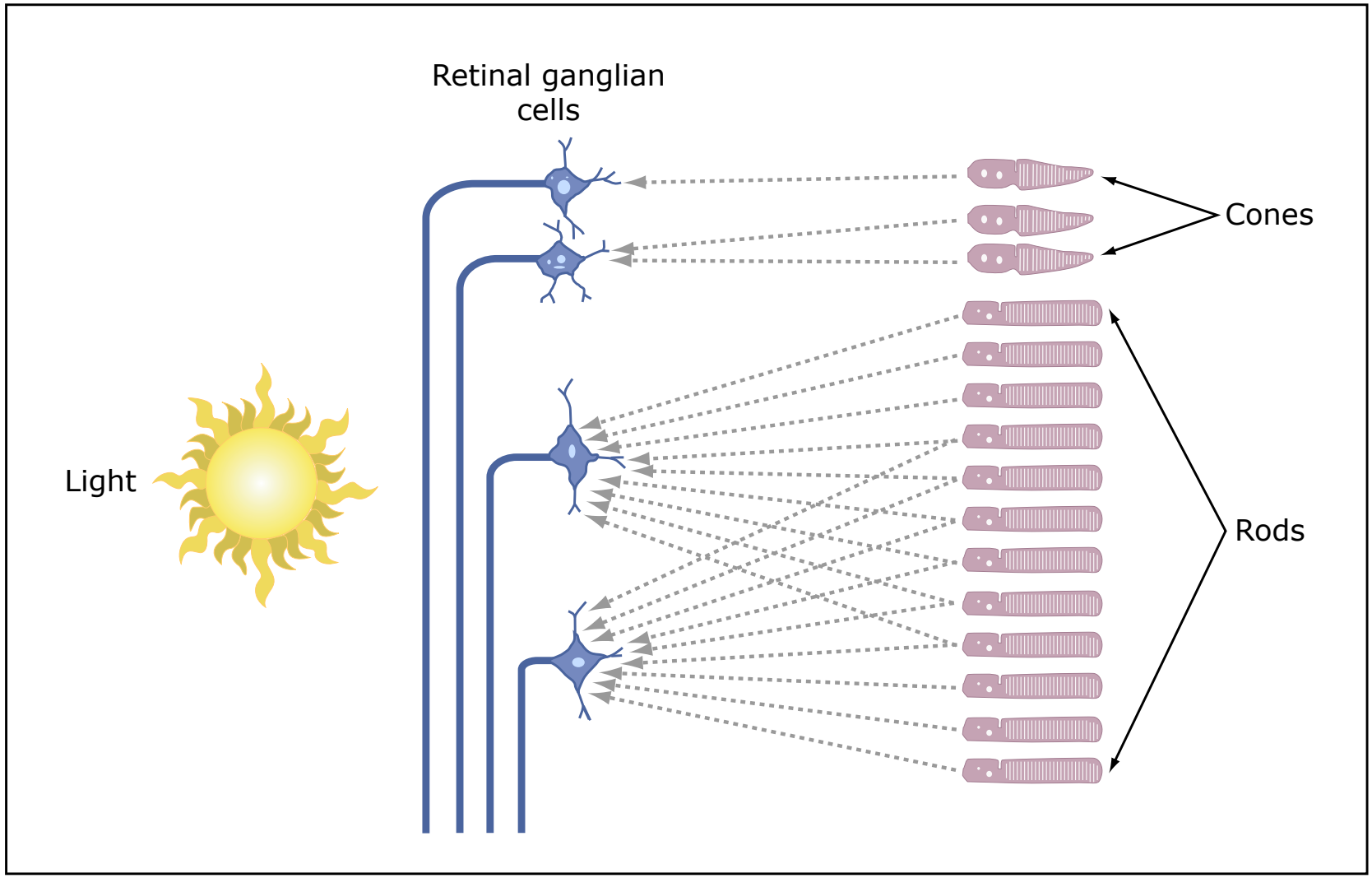


Image by MIT OpenCourseWare.

FIGURE 7.6. A schematic representation of the convergence of rods and cones on retina ganglion cells. There is a high degree of convergence in the rod system and a low degree of convergence in the cone system.

Receptive fields **- area of external space in which a stimulus activates a neuron**

Retinotopy **- topographic map of visual space across a restricted region of the brain - maintenance of orderly spatial relations**

Certain Retinal Ganglion Cells Project to the Lateral Geniculate Nucleus; Signals Are Then Sent To Primary Visual Cortex

Myer's loop

Optic nerve

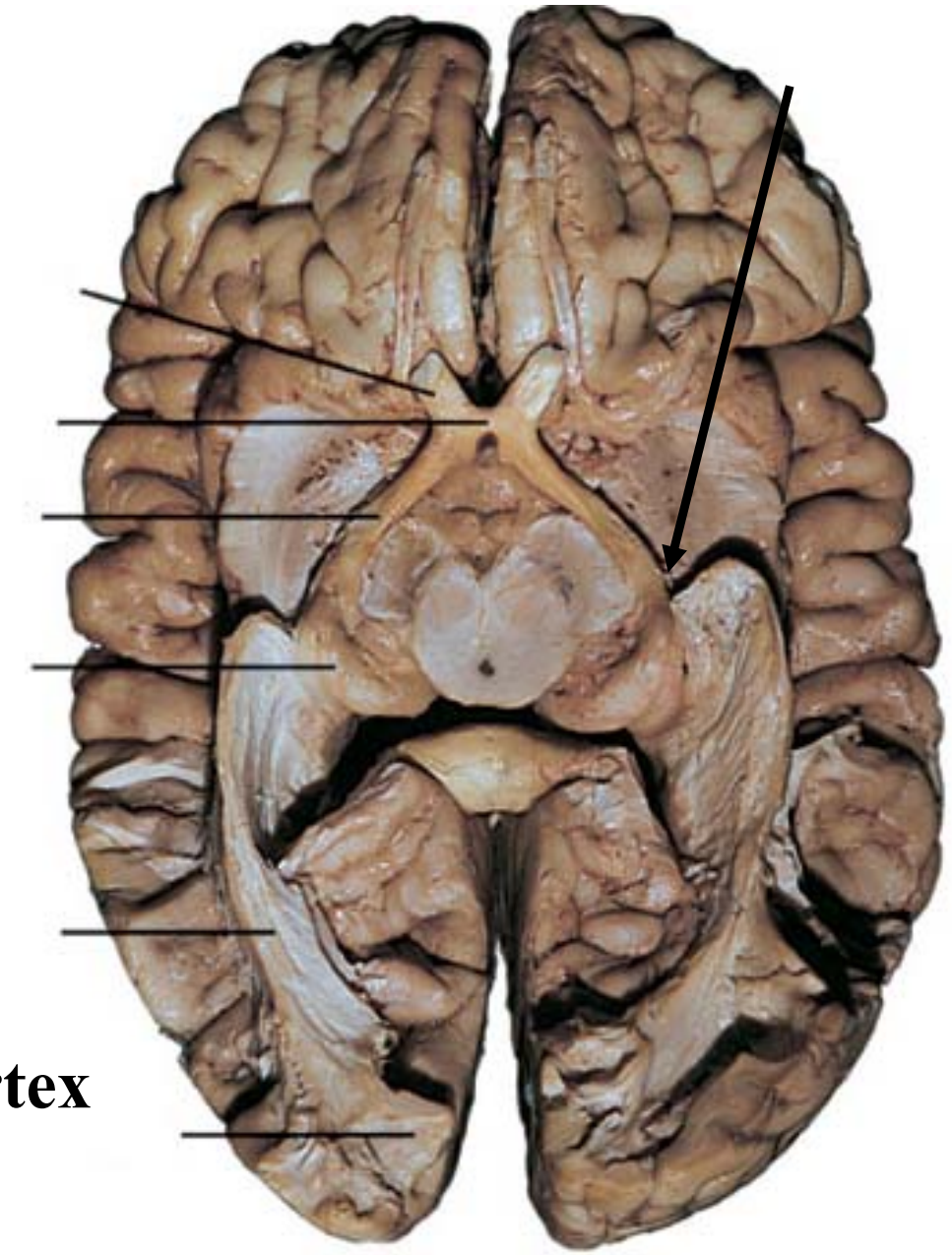
Optic chiasm

Optic tract

Lateral geniculate nucleus

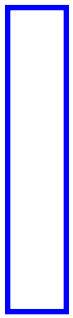
Optic radiation

Primary visual cortex



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Image of lgn in a macaque monkey removed due to copyright restrictions.
See: Oxford Journals



Magnocellular	*Parvocellular*
large cells	**small cells**
rods	**cones**
large RFs (3X)	**small RFs**
rapid, transient,	**slow, sustained,**
color-blind	**wavelength-sensitive**
low contrast sensitivity	**high contrast sensitivity**
	unique to primates
	10 X more than M cells

Visual Field Maps in Human Visual Cortex

Left visual field images are communicated to right (contralateral) visual cortex.

Right visual field images are communicated to left visual cortex.

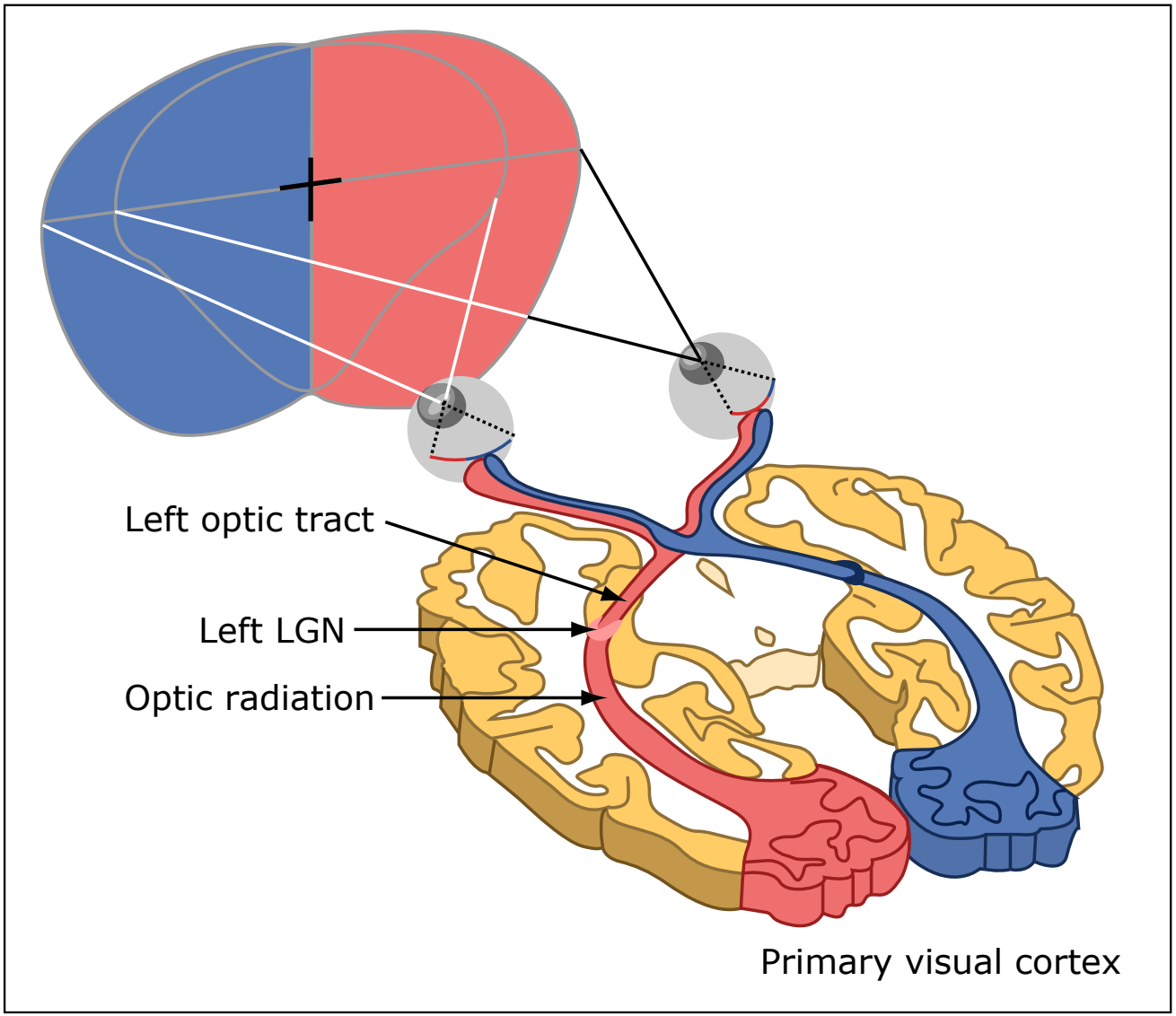


Image by MIT OpenCourseWare.
After Figure 10-4b in Bear, Mark F., Barry W. Connors, and Michael A. Paradiso. Neuroscience: Exploring the Brain. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins, 2007. ISBN: 9780781760034.

Cortical Vision

- **55% of primate cortex is visual**

 11% touch, 3% auditory

- **32 distinct visual areas in monkey**
- **proliferation**

 one LGN = 1 million neurons

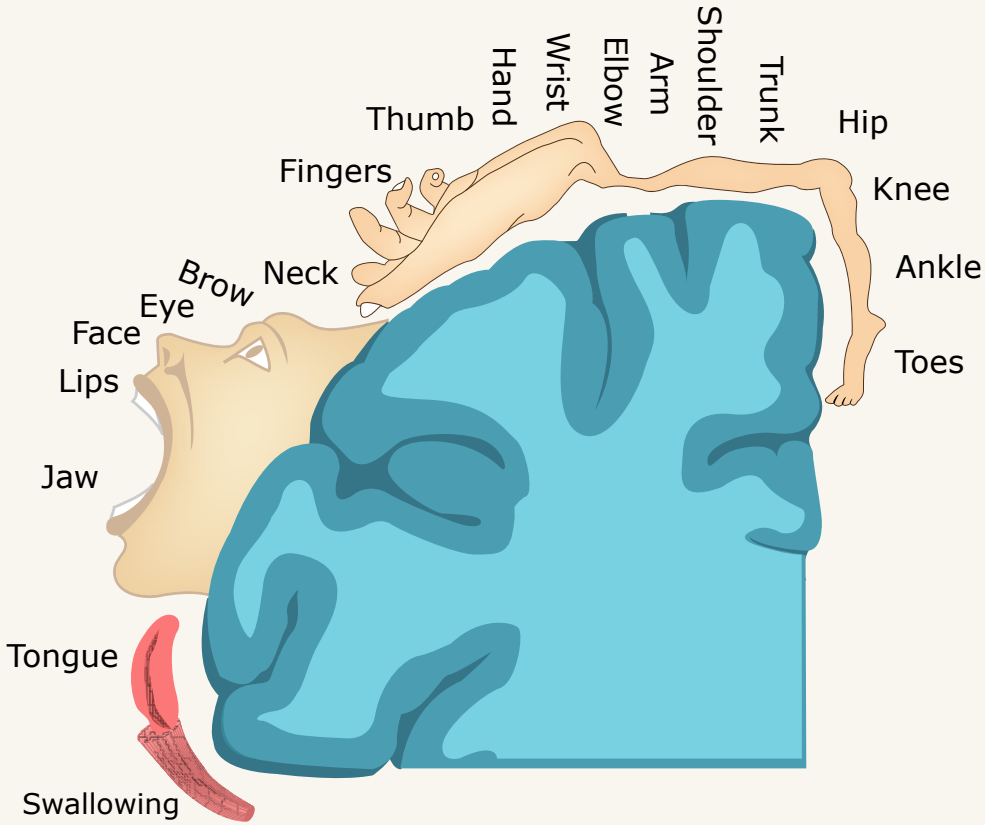
 V1 (striate)= 250 million neurons

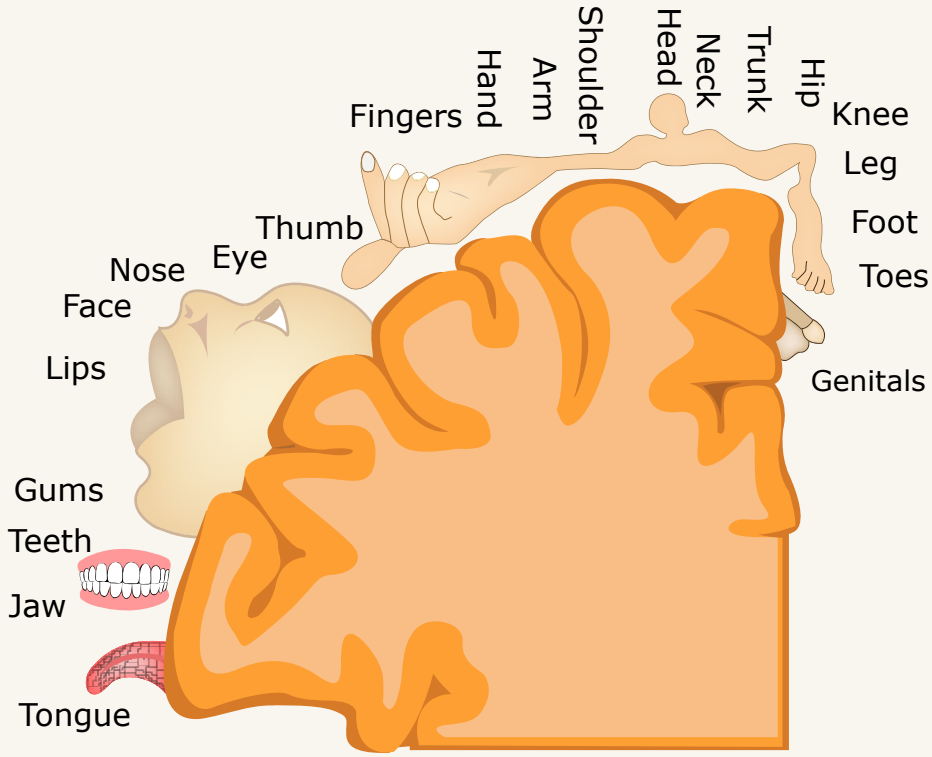
 extrastriate = 400 million neurons

 1.3 billion visual cortical neurons

 600 cortical/1 LGN neuron

Image highlighting the primary visual cortex removed due to copyright restrictions.
See: Wikipedia



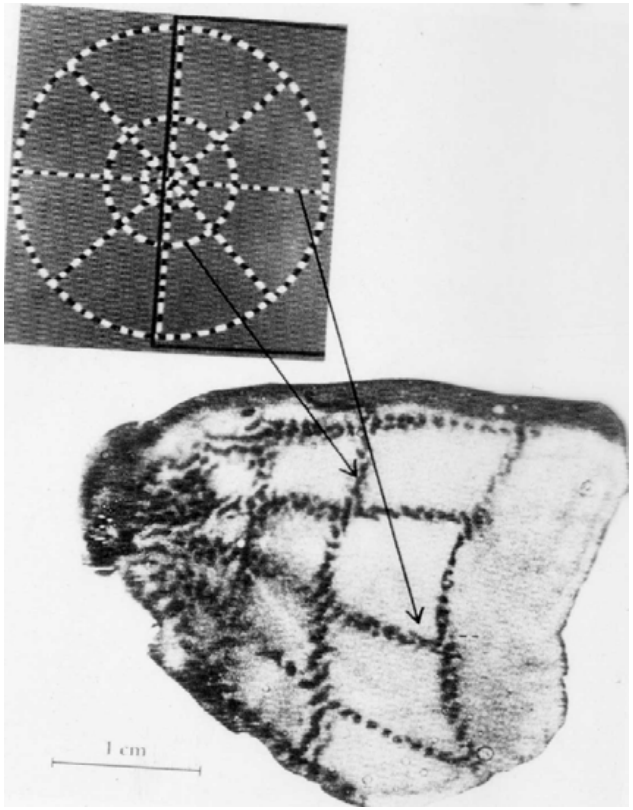


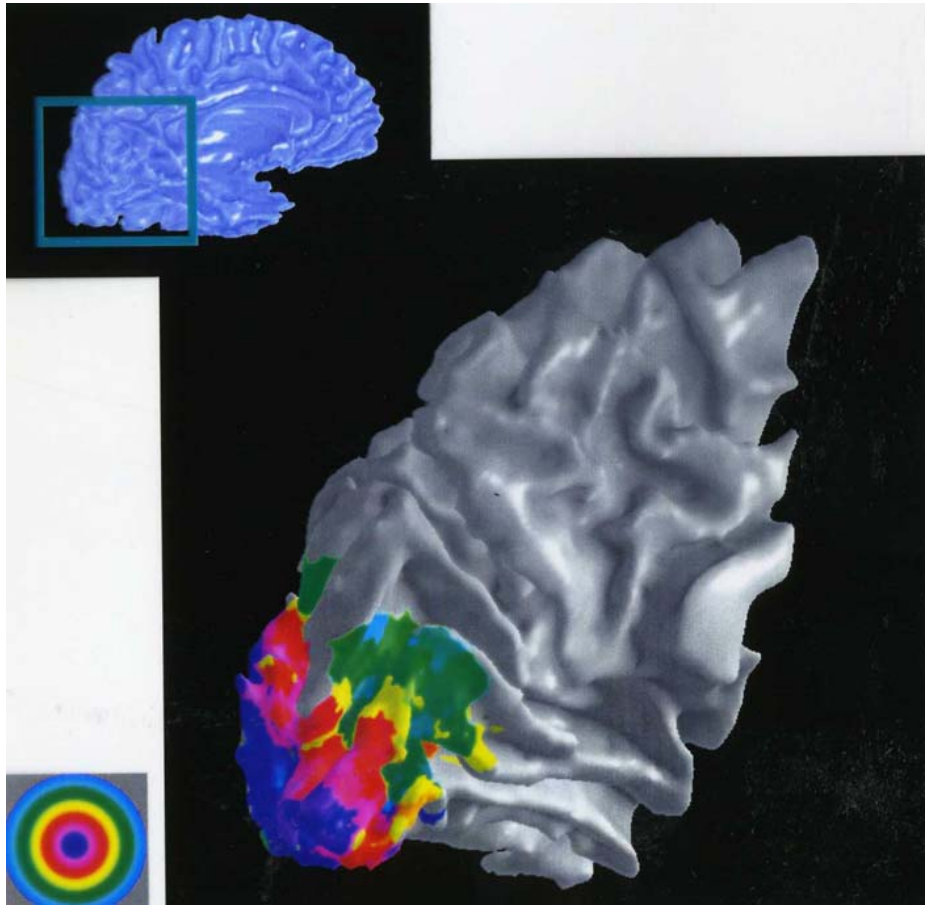
Motor Cortex **Somatosensory Cortex**

Image by MIT OpenCourseWare.

Image of primary and secondary auditory cortexes removed due to copyright restrictions. For a similar image, see: Willrosellini.com.

Topography:
Retinotopy in visual cortex





Monkey V1 (2-deoxyglucose) **Human visual cortex (fMRI)**

Courtesy of Unknown. Used with permission.

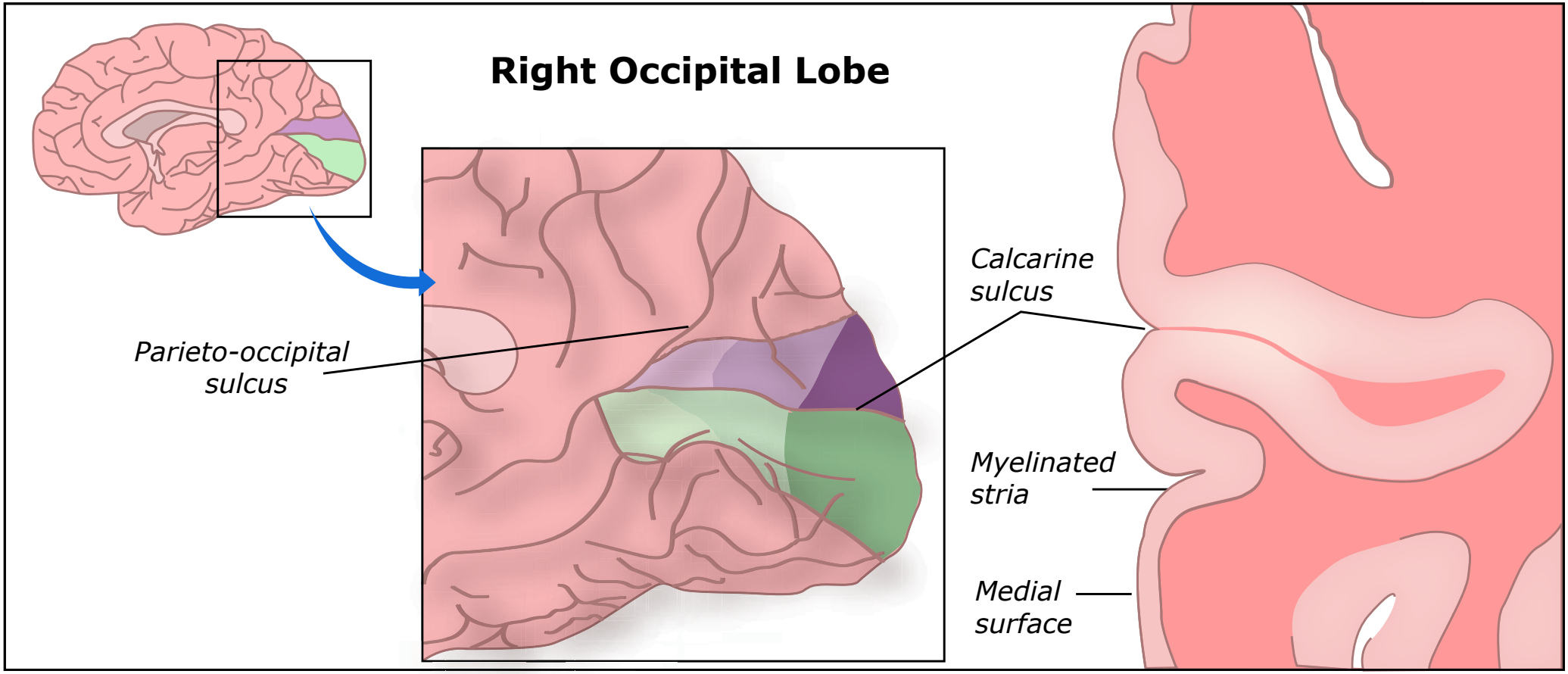
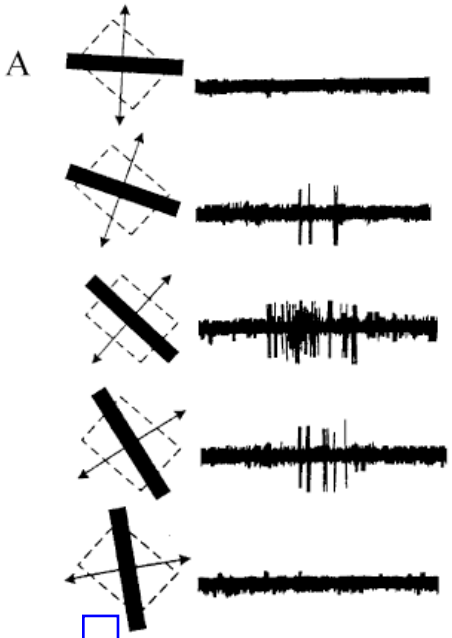


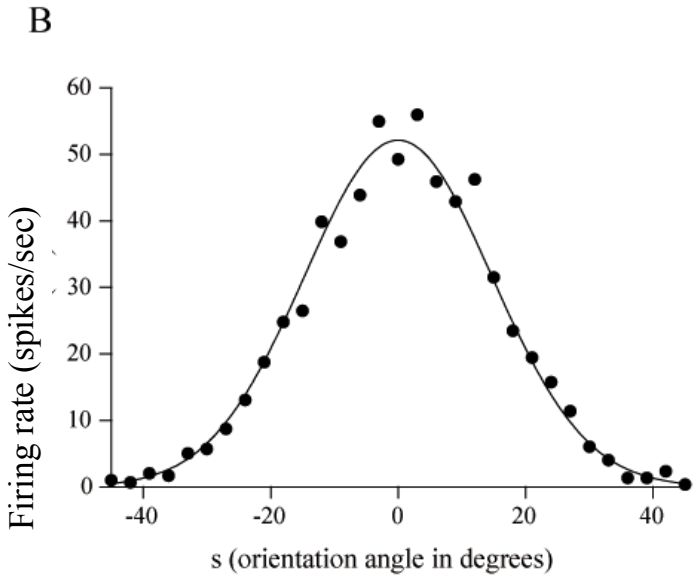
Image by MIT OpenCourseWare.

Visuotopic organization of the striate cortex in the right occipital lobe (mid-sagittal view):
Foveal Magnification

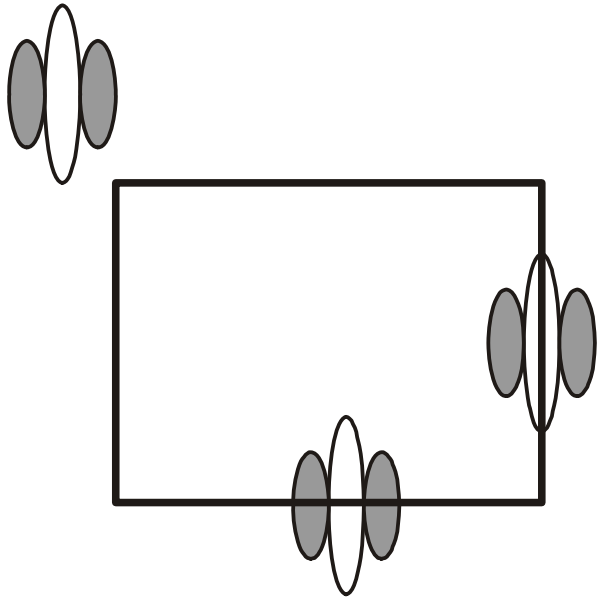
Single unit recordings in V1: Orientation selectivity



V1 data



Stimulus orientation (deg)



Model

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Diagram of the “wiring map” of projections removed due to copyright restrictions.

For a similar image, see MIT.edu.

What and Where Systems

- **landmarks test in monkey**

 where - parietal impaired, temporal ok

 what - temporal impaired, parietal ok

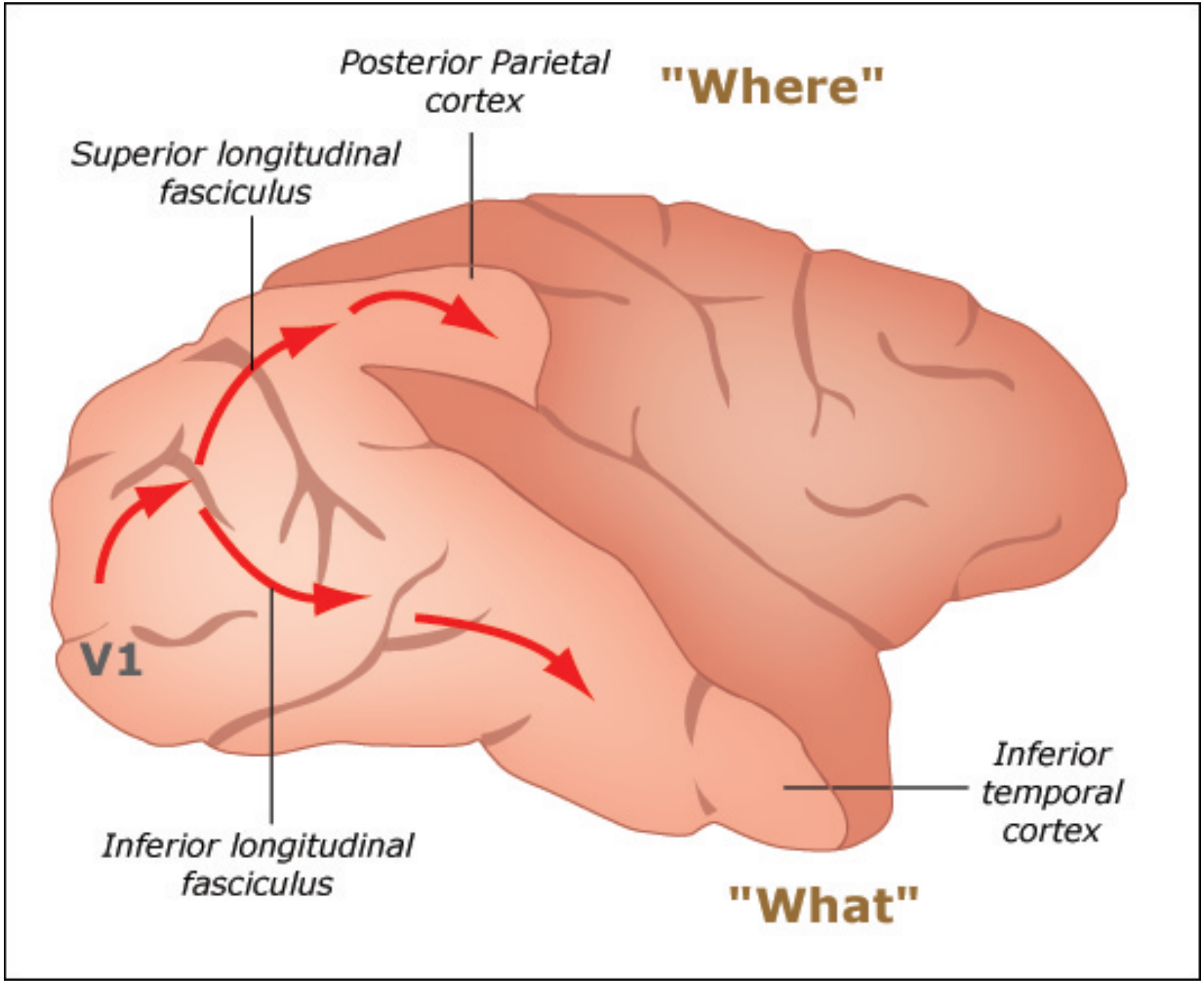


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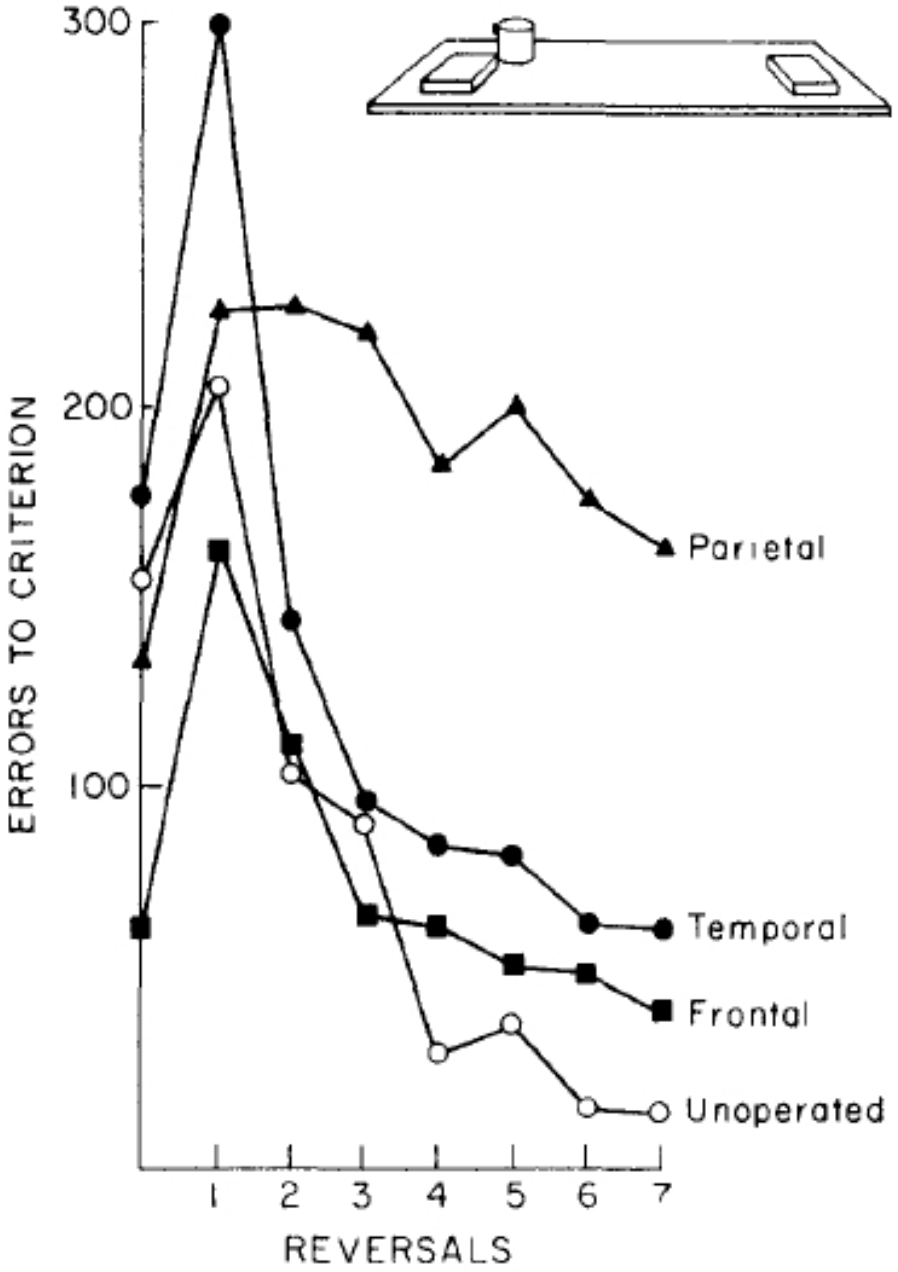


FIG. 6. Performance of unoperated control and three lesion groups on the landmark reversal task. (Upper diagram represents test situation.)

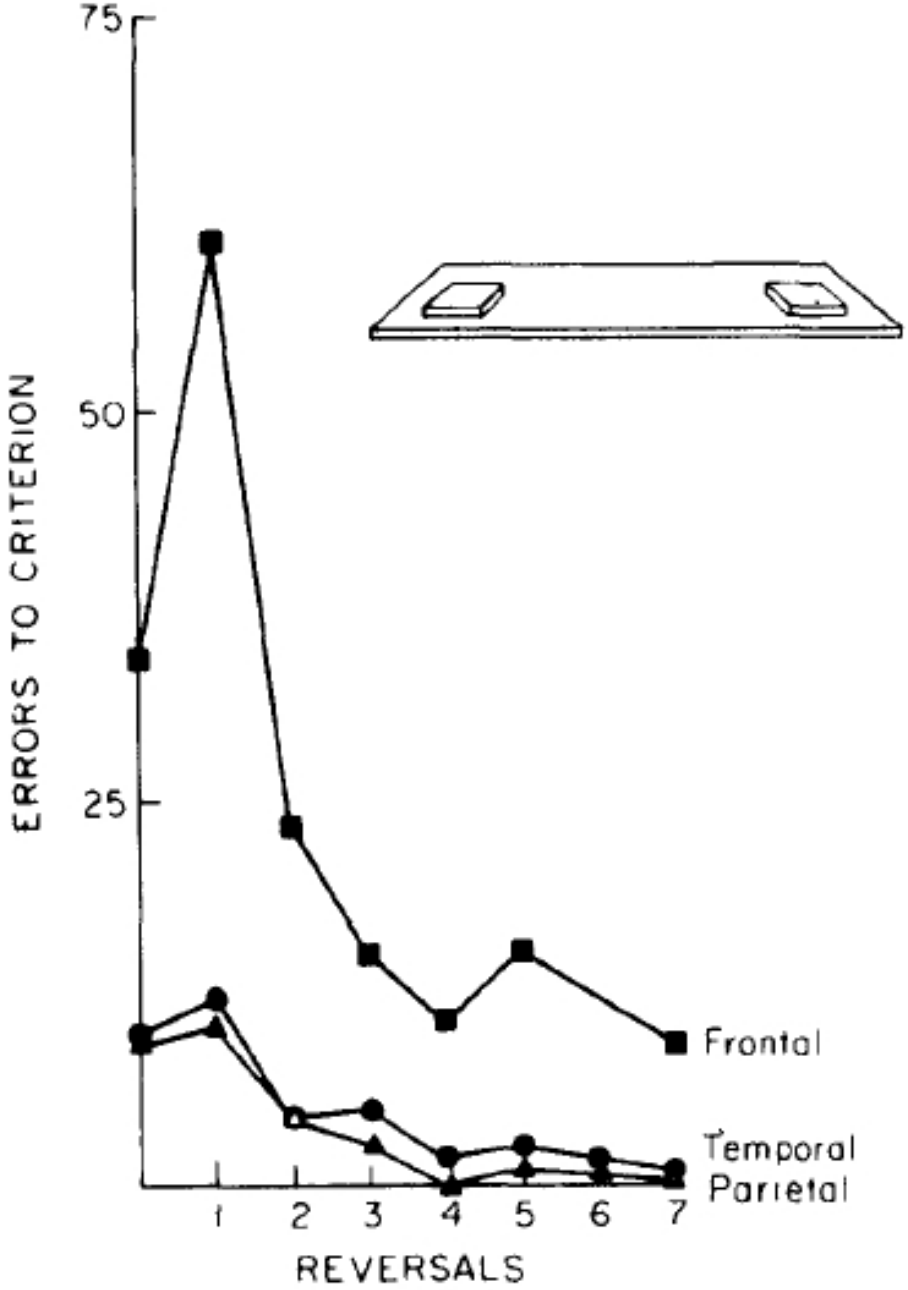


FIG. 7. Performance of three lesion groups on the place reversal task. (Upper diagram represents test situation.)

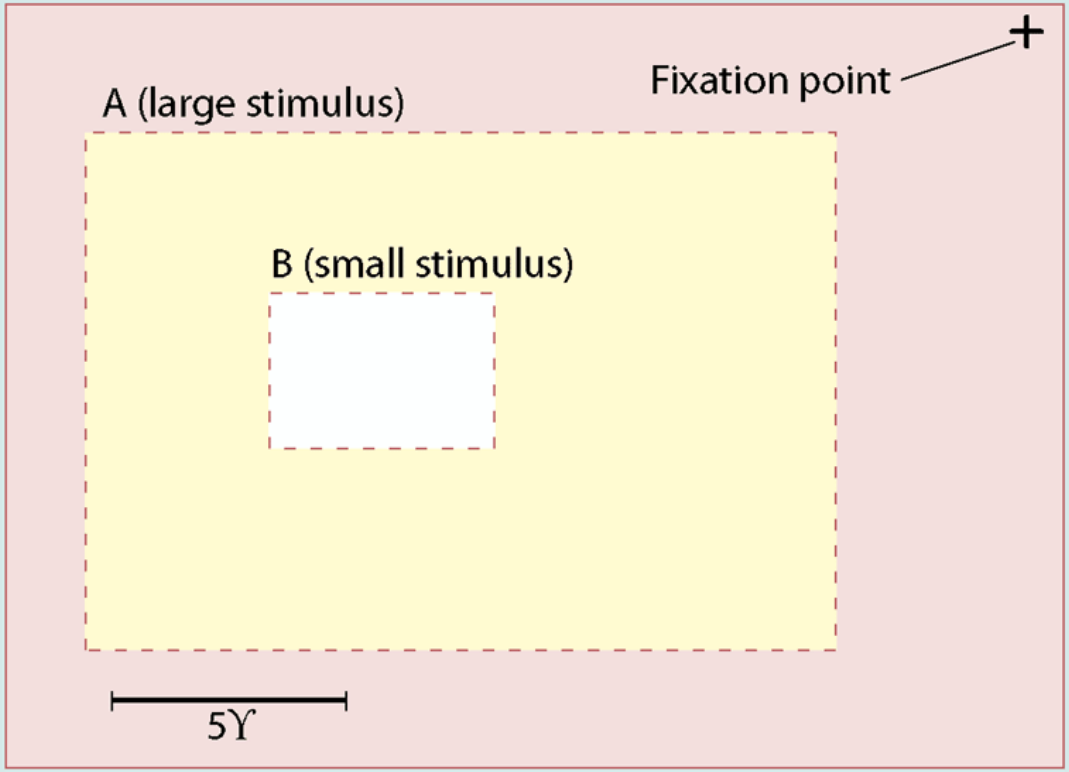
Copyright © 1973 by the American Psychological Association. Reproduced with permission. Pohl, W. "Dissociation of Spatial Discrimination Deficits Following Frontal and Parietal Lesions in Monkeys." *Journal of Comparative and Physiological Psychology* 82 (1973): 227–39.
The use of APA information does not imply endorsement by APA.

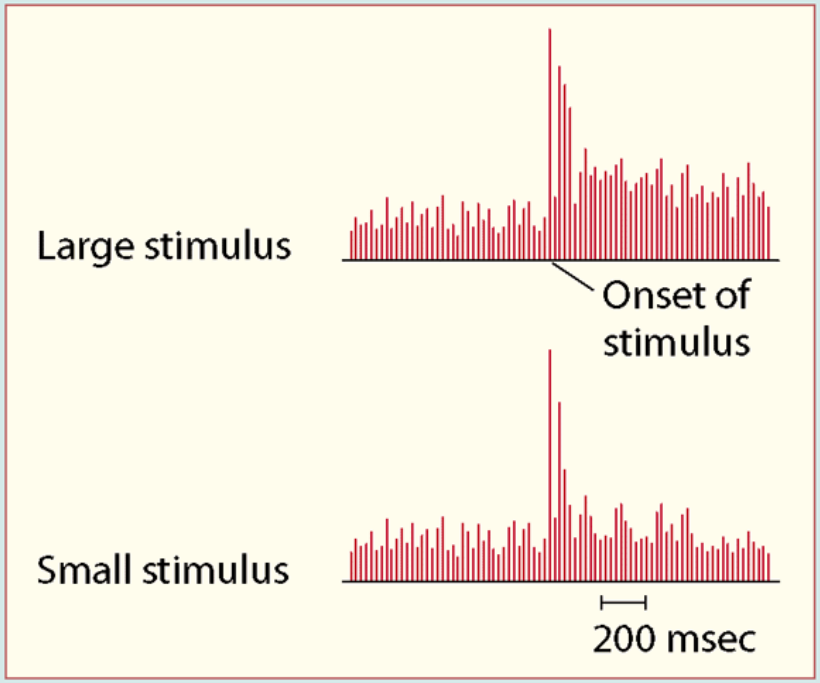
Where:

40% of parietal neurons have foveal receptive fields, 60% have non-foveal receptive fields;

What:

100% of temporal neurons have foveal receptive fields





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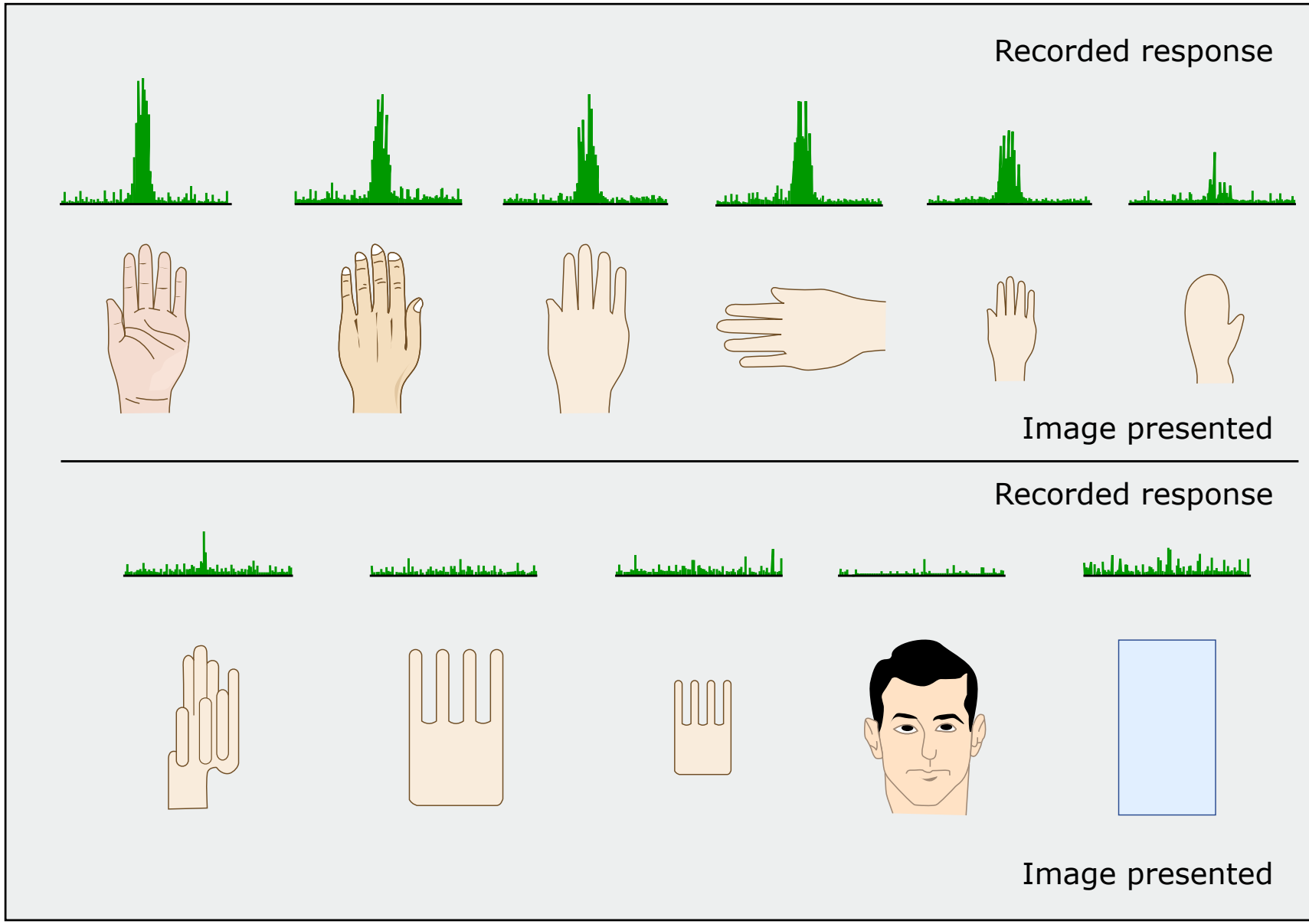


Image by MIT OpenCourseWare.

Graphs related to response spikes of facial recognition removed due to copyright restrictions. For the graphs from which the image was adapted, see Perrett, D. I., E. T. Rolls, and W. Caan. "Visual Neurones Responsive to Faces in the Monkey Temporal Cortex." *Exp Brain Res* 47 (1982): pp. 329-42.

What and Where Systems

- **Balint's syndrome**

 bilateral parietal-occipital lesions

 identification (what) intact

 problems in localizing, reaching, redirecting gaze, estimating distance, navigation

What and Where Systems

- **Where system = vision for action?**

Patient DF

Extensive ventral bilateral damage

Poor perception of shape and orientation (what)

Reaching for slot at different orientations

Good hand orientation and grasping

Dissociation of object perception and use of that information to guide action

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Fall 2011

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PERCEPTION: VISION II

John Gabrieli 9.00



Image courtesy of orangeacid on Flickr. CC-BY.

Vision 2: Object Recognition

- Objects & Agnosia
- Faces
- Words

Vision 2: Object Recognition

- **Objects & Agnosia**
 - **Apperceptive Agnosia**
 - **from parts to percept**
 - **Associative Agnosia**
 - **from percept to meaning**
 - **Category-Specific Knowledge**
 - **relation to perception & action**

AGNOSIA

Modality-specific inability to recognize a stimulus that is not explained by sensory, attentional, linguistic, or other defects

AGNOSIA

Apperceptive agnosia

- **failure to construct conscious percept from sense data**
- **right hemisphere**

Associative agnosia

- **conscious percept (match, copy) stripped of meaning**
- **left hemisphere**

Lissauer, 1890

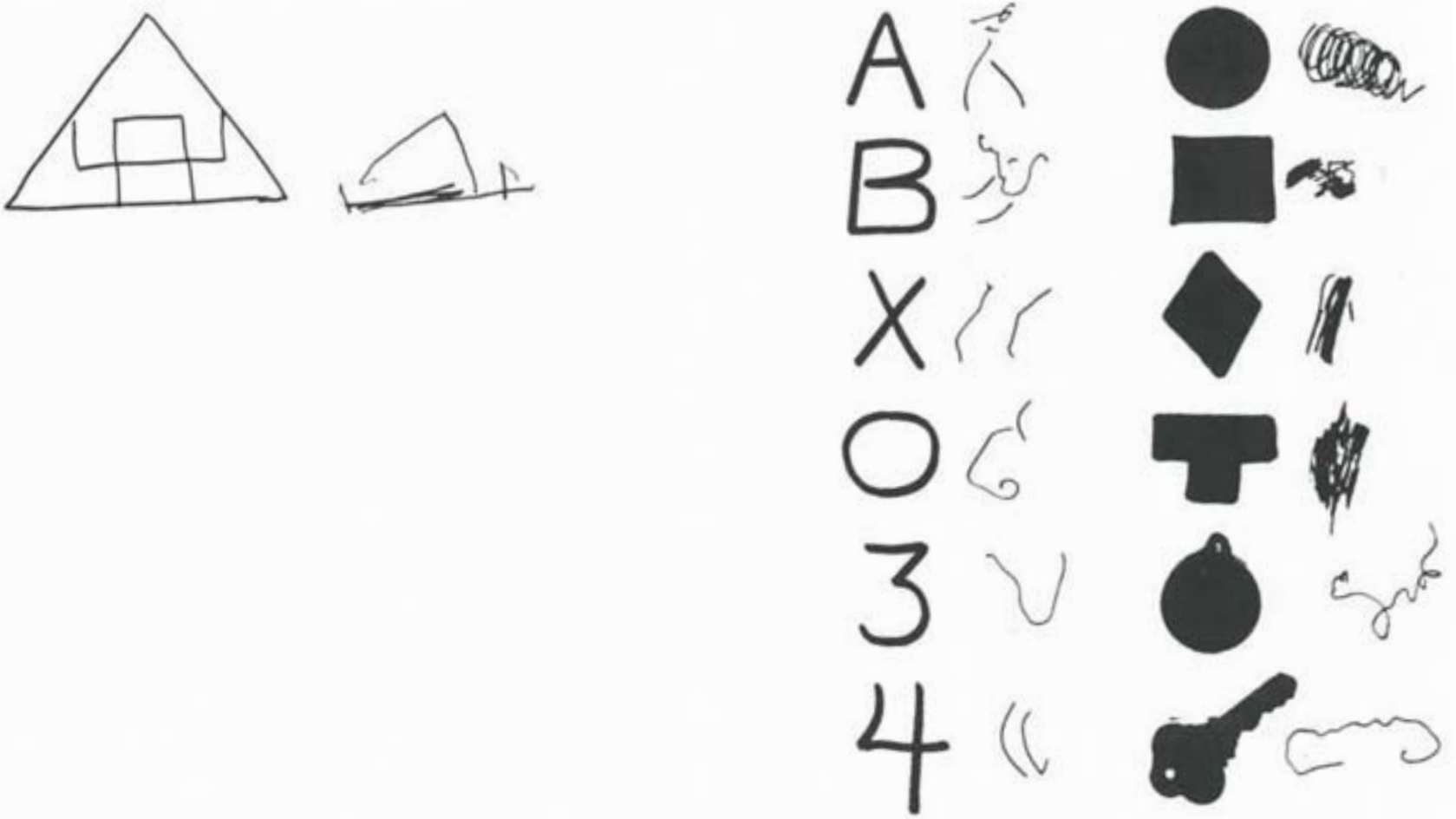


Figure 2
The copying ability of apperceptive agnosic patients. On the left is a simple geometric shape and patient E. S.'s copy. On the right are two columns of letters, numbers, and shapes, with the patient Mr. S's copies.

Courtesy of MIT Press. Used with permission.

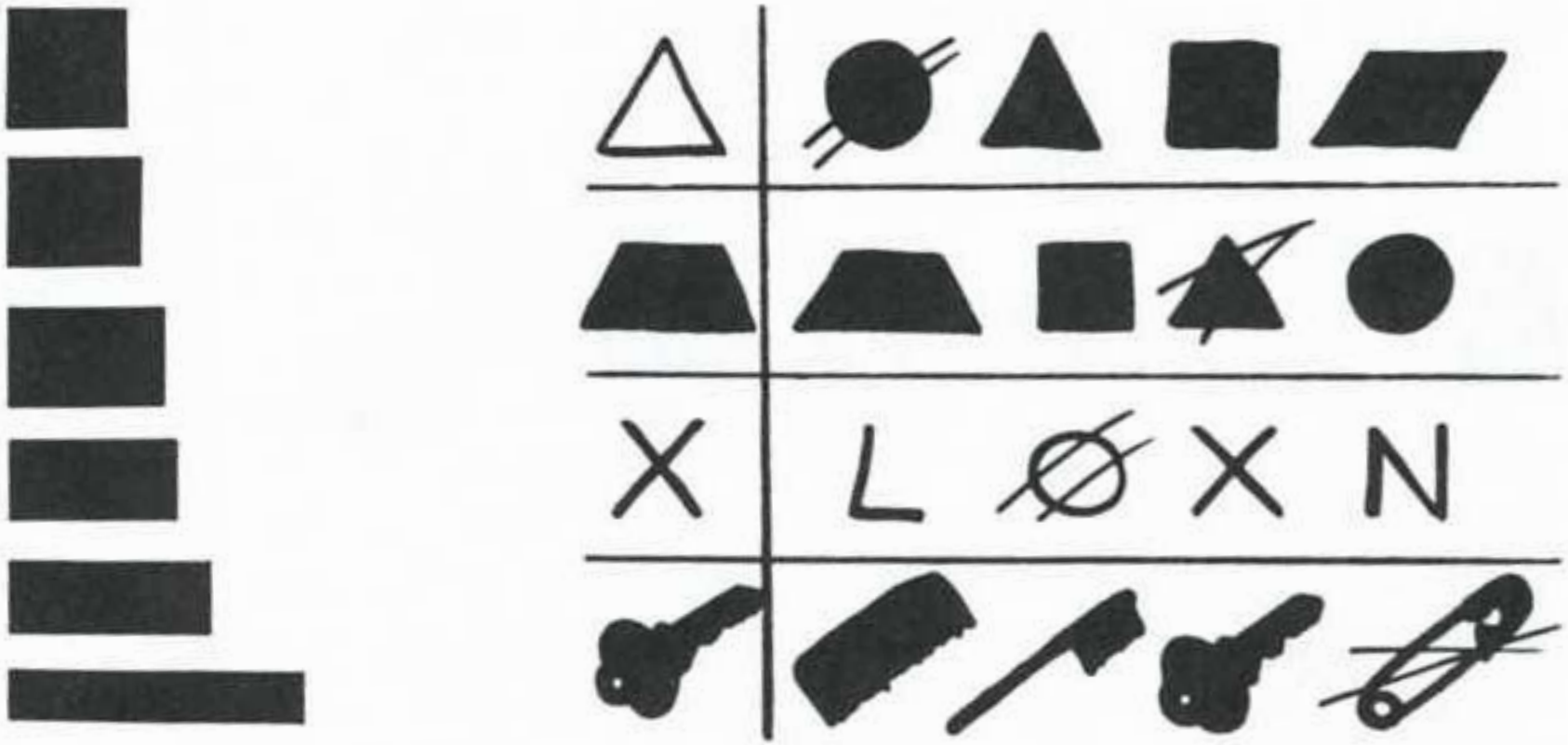


Figure 3.
The shape matching ability of apperceptive agnosic patients. On the left is a set of rectangles matched for overall area, which were presented pairwise to Mr. S. to be judged same or different in shape. He was unable to discriminate all but the most distinctive, and made errors even with these. On the right are a set of rows containing a target shape (left) and a set of four choices to be matched with the target shape. Mr. S.'s answers are marked.

Courtesy of MIT Press. Used with permission.



Figure 4
Patient X, studied by Landis et al. (1982), consistently read this stimulus as 7415.

Courtesy of MIT Press. Used with permission.

Drawings of an elephant by patients with agnosia, from "The Working Brain: An Introduction to Neuropsychology." Aleksandr R. Luria, have been removed due to copyright restrictions.
Please see figure 29, on page 119, on Google Books.

AGNOSIA

Apperceptive agnosia

- **failure to construct conscious percept from sense data**
- **right hemisphere**

Associative agnosia

- **conscious percept (match, copy) stripped of meaning**
- **left hemisphere**

Lissauer, 1890

Drawings done by angosia patients, from Alan B. Rubens, MD; D. Frank Benson, MD. "Associative Visual Agnosia." *Arch Neurol* 24 no. 4 (1971): 305-516, have been removed due to copyright restrictions.



Photo courtesy of ndrwfgg on Flickr. CC-BY.

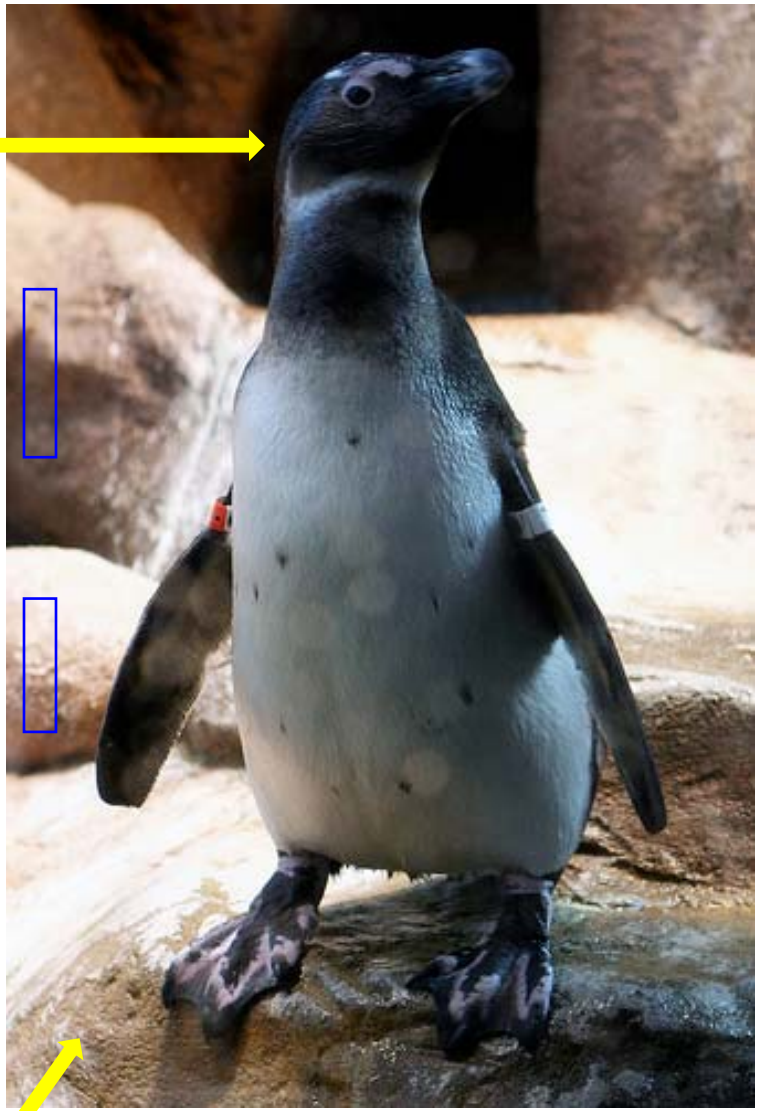


Photo courtesy of niallkennedy on Flickr. CC-BY-NC.



Photo courtesy of Tess Aquarium on Flickr.

Category-Specificity in Loss of Knowledge

Patients who can define and word-picture match manufactured objects, but not foods and animals

Patients who can define and word-picture match foods and animals, but not objects

Category-Specificity in Loss of Knowledge

Patients who can define and word-picture match manufactured objects, but not foods and animals

Ok on body parts, bad on musical instruments

Patients who can define and word-picture match foods and animals, but not objects

Better on large outdoor objects than small manipulable objects

Visual Similarities Among Musical Instruments



Photo courtesy of mitko_denev on Flickr. CC-BY-NC.



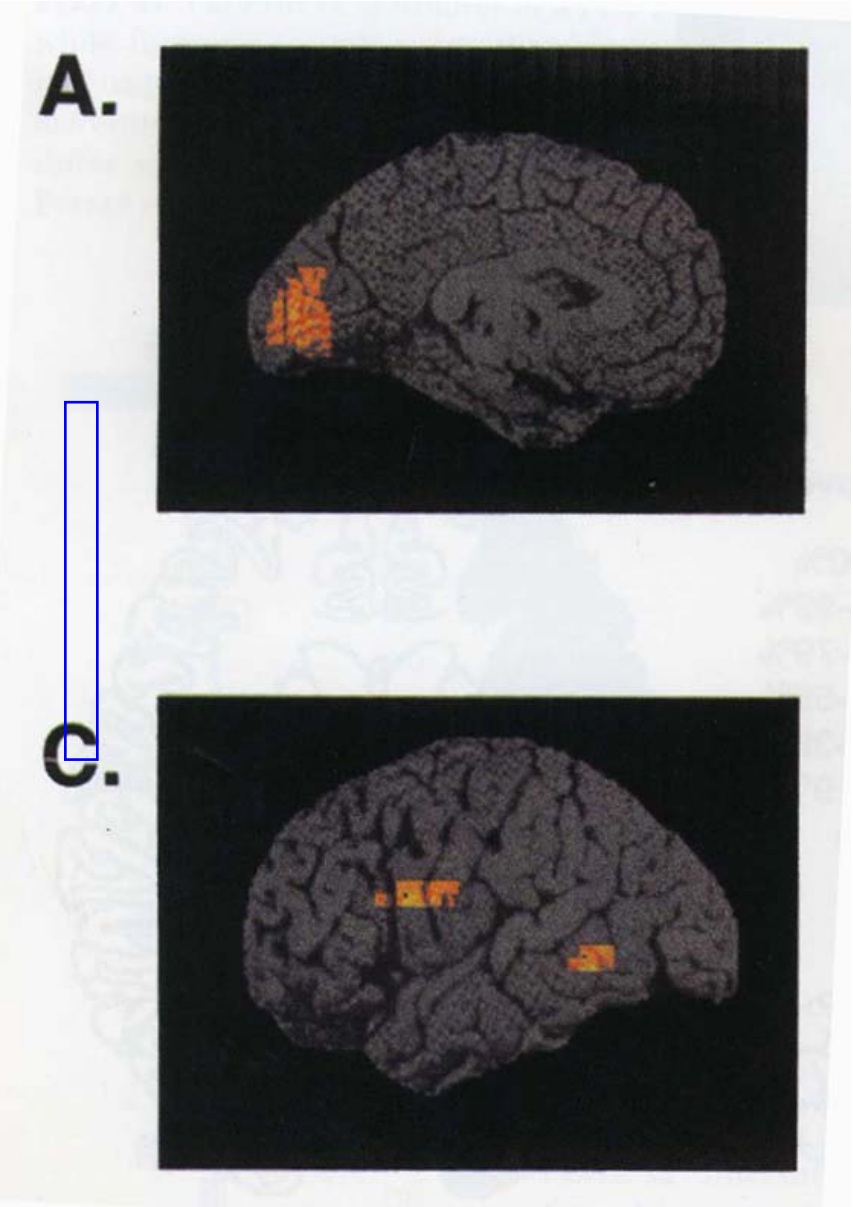
Photo courtesy of crabchick on Flickr. CC-BY.

Category-Specificity in Loss of Knowledge

How do we know and experience objects in the world?

- **Visual experience (fine visual distinctions)**
- **Functional/motor experience**

Name Line Drawings or Words



Animals > Tools

Visual cortex

Tools > Animals

Visual motion
Hand action

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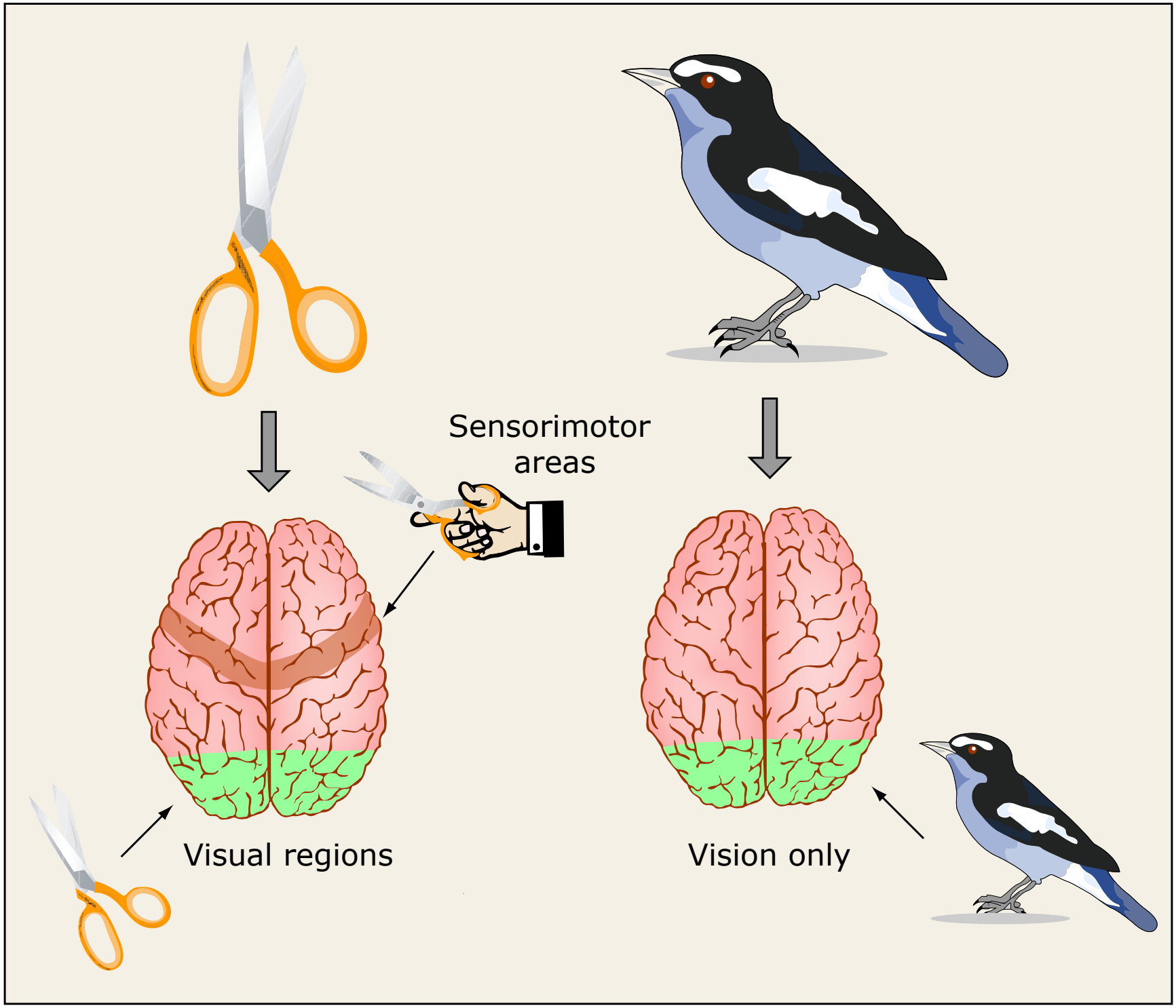


Image by MIT OpenCourseWare.

FACES



This is public domain.



Photo courtesy of Pete Souza, The Obama-Biden Transition Project. CC-BY.

FACES

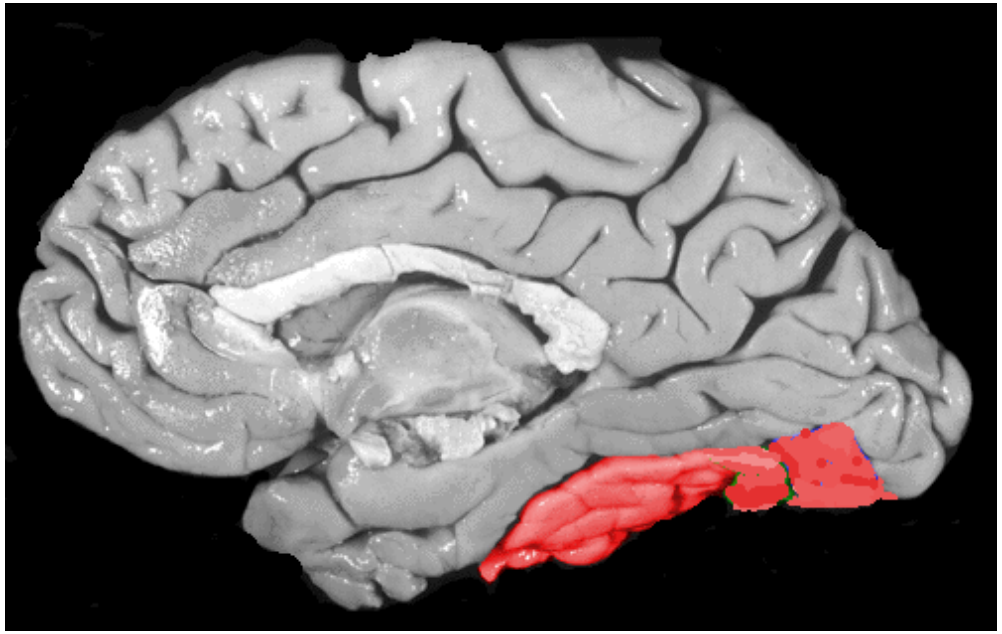
- **Identity**
- **Expression (feelings)**

PROSPAGNOSIA

Selective deficit in recognizing faces posterior cortical lesion also developmental prognosia

fMRI Data Analysis : Region of Interest (ROI)

Anatomical ROI

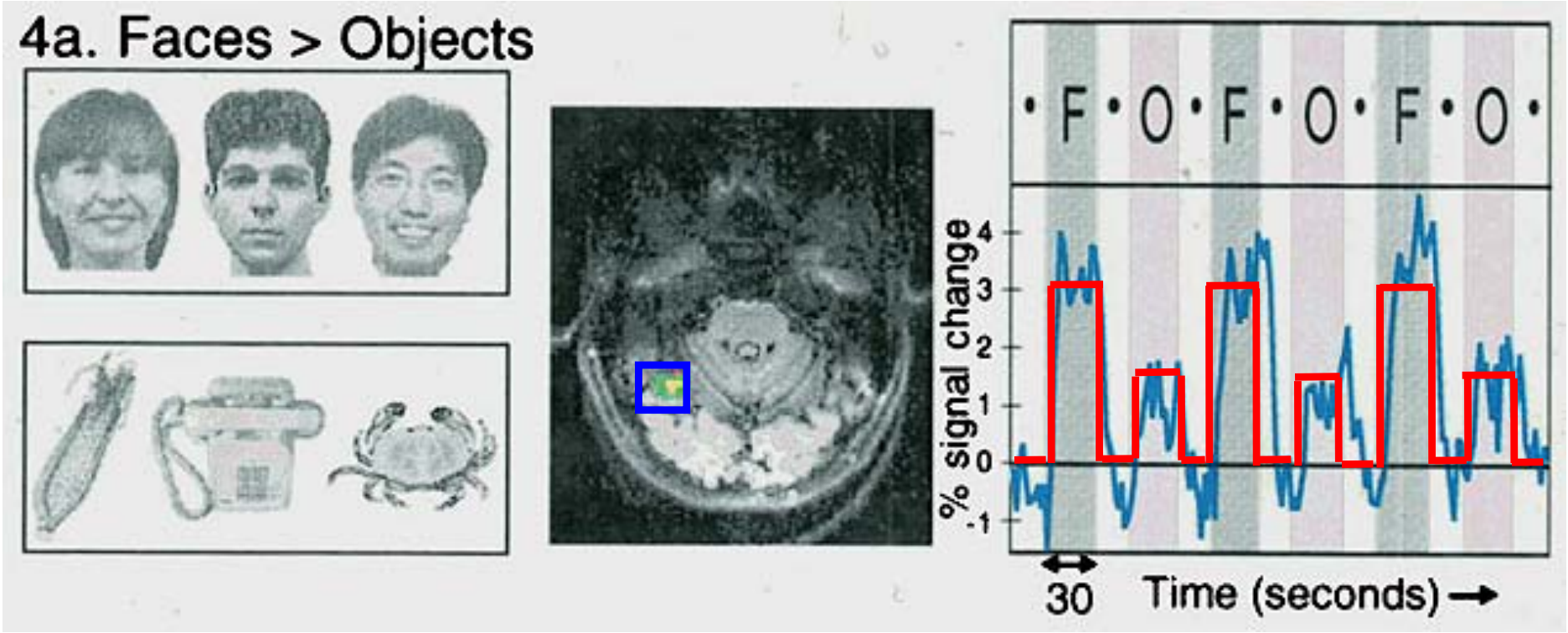


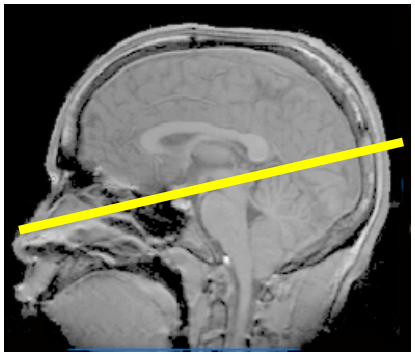
Functional ROI



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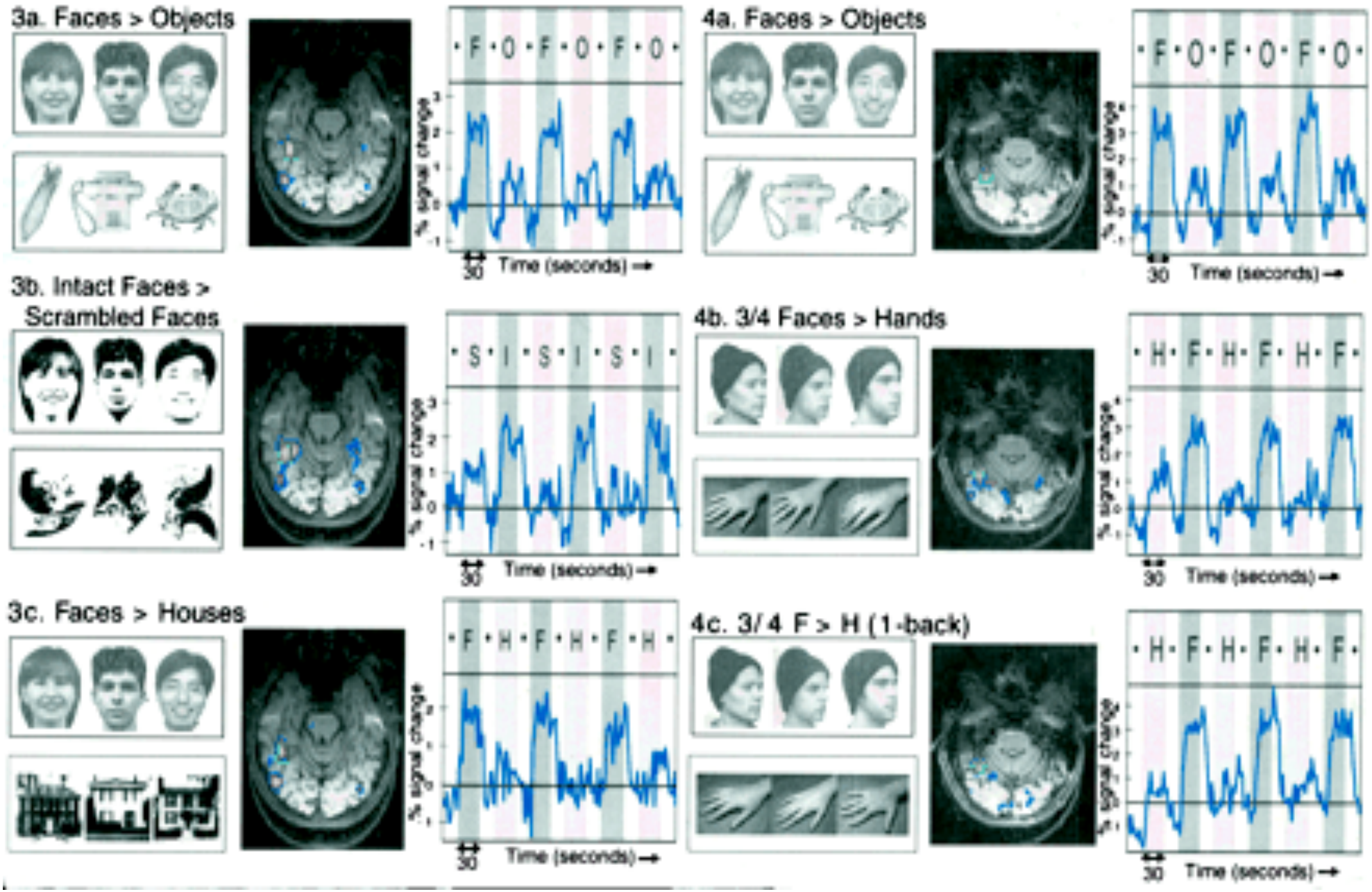
Fusiform & Face Expertise: Fusiform Face Area (FFA)





Courtesy of Kanwisher Lab. Used with permission.

Selective FFA Response to Faces



Courtesy of Kanwisher Lab. Used with permission.

Vision 2: Object Recognition

- **Faces**
 - **- infant preference for faces top-heavy bias**
 - **- development of species-specific face processing**
 - **- configural processing of faces**
 - **- genetic preparation for face processing**

Figure 1 from Cassia, Viola Macchi, Chiara Turati, and Francesca Simion. "Can A Nonspecific Bias Towards Top-Heavy Patterns Explain Newborns' Face Preference?" *Psychological Science* 15 (2004): 379-83.
Removed due to copyright restrictions.

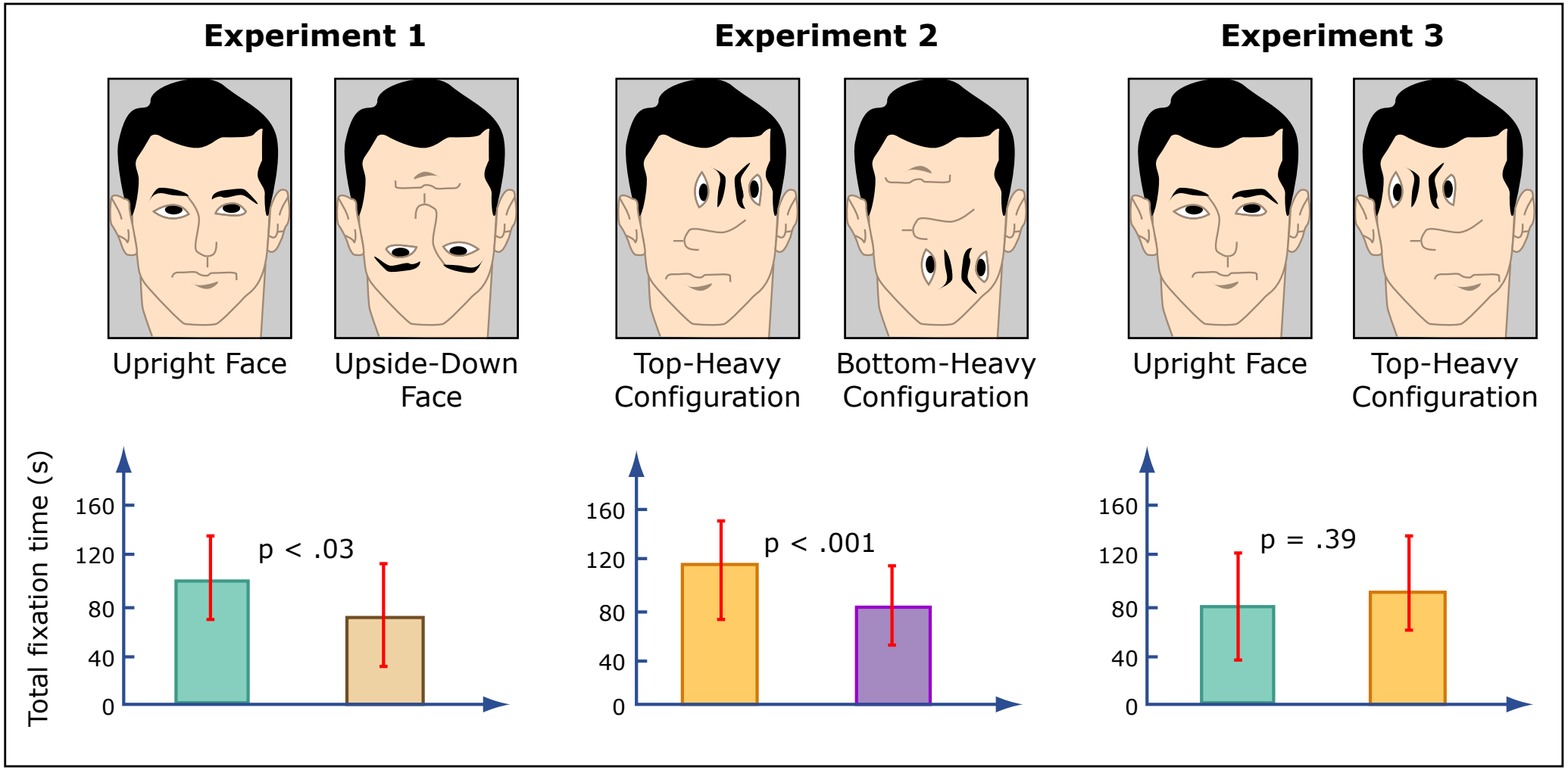


Image by MIT OpenCourseWare.

FACES

Faces - configural - whole rather than the parts (eyes, nose, mouth)

This is Obama



Photo courtesy of Pete Souza, The Obama-Biden Transition Project. CC-BY.

This is Obama's house



Photo courtesy of Tom Lohdan on Flickr. CC-BY.

Test phase

Is this Obama's nose?



Part condition



Photo courtesy of Pete Souza, The Obama-Biden Transition Project. CC-BY.

Whole condition

Is this Obama's window?

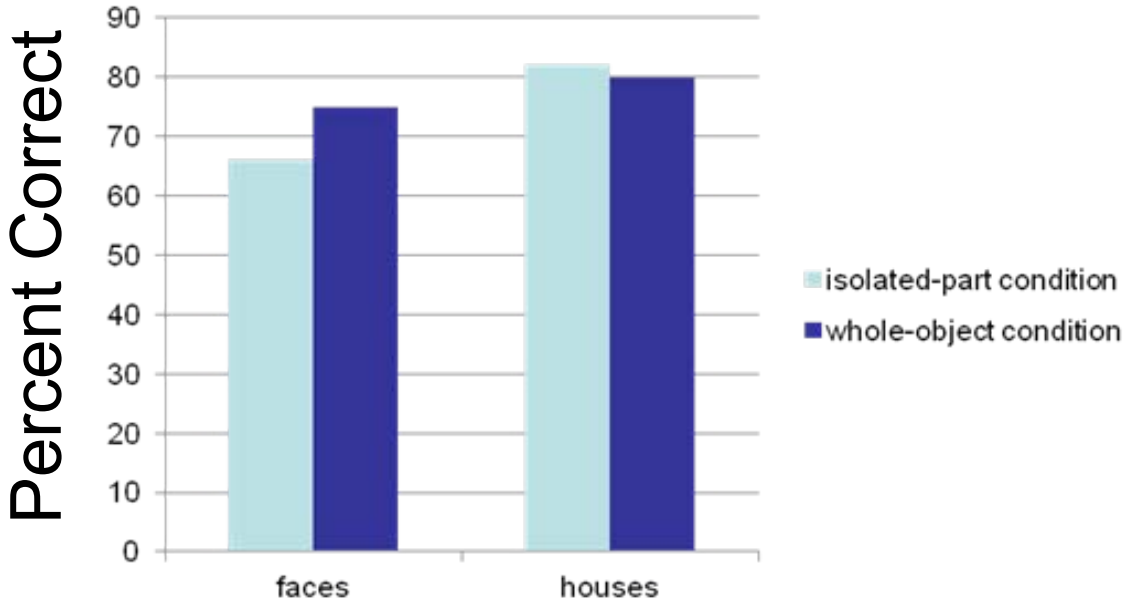


Part condition



Photo courtesy of Tom Lohdan on Flickr. CC-BY.

Whole condition



Adapted from Farah, M.J., Specialization Within Visual object Recognition: Clues from Prosopagnosia and Alexia, in Farah, M.J., and Ratcliff, G. (Eds.), The Neuropsychology of High-Level Vision: Collected Tutorial Essays. Hillsdale, NJ: Lawrence Erlbaum Associates, 1994, pp. 133–146.

- no early exposure to faces 6-24 months
- before seeing a real face, preferred human & monkey faces in photographs equally, discriminated human & monkey faces
- gained expertise for 1 month in exposed species of faces (human or monkey) only
- Preferred only the exposed species vs. objects
- Preferrence lasted for at least a year despite exposure to humans & monkeys

Genetic preparation & Sensitive period



Courtesy of National Academy of Sciences, U.S.A. Used with permission.
Source: Sugita, Yoichi. "Face Perception in Monkeys Reared With No Exposure to Faces." *PNAS* 105, no. 1 (2008): 394-8. Copyright (c) 2008 National Academy of Sciences, U.S.A.

Fig. 1. An infant monkey and her living circumstance
Sugita, Yoichi (2008) Proc. Natl. Acad. Sci. USA 105, 394-398

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Cuneiform – 3200 BC



Photo courtesy of litlnemo on Flickr.

Gutenberg Bible – Printing Press – 1450s



Photo by Pat Hawks on Flickr. CC-BY.

Adult Reading

- **we read fast – can read one word that we know, from among 50,000 – 100,000 words that we know in *50 thousandths of a second!***
- **typical adult reading speed is 200-250 words per minute**
- **we read about 12 letters at a time, then move eyes**

Moving Window Experiment

- **track eye movements (McConkie & Raynor, 1975)**
- **with each movement, replace all others letters with x's**
- **people did not notice the x's**

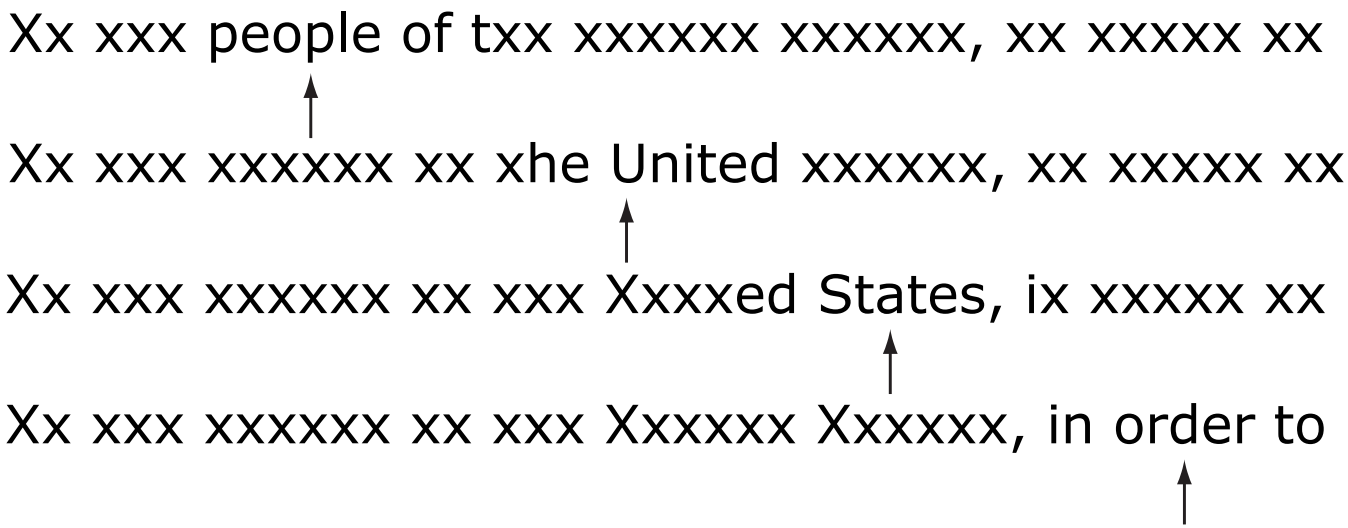


Figure 1.1 from "Reading in the Brain: The Science and Evolution of a Human Invention," Stanislas Dehaene, has been removed due to copyright restriction. See: Google Books.

Word Blindness/Alexia

Mr C – 1887 – could not read

Could see

Could hear words, speak words

Could see numbers

Write down words to dictation

Figure 2.7 from "Reading in the Brain: The Science and Evolution of a Human Invention," Stanislas Dehaene, has been removed due to copyright restriction.

Figure 2.7 from "Reading in the Brain: The Science and Evolution of a Human Invention," Stanislas Dehaene, has been removed due to copyright restriction.

Vision 2: Object Recognition

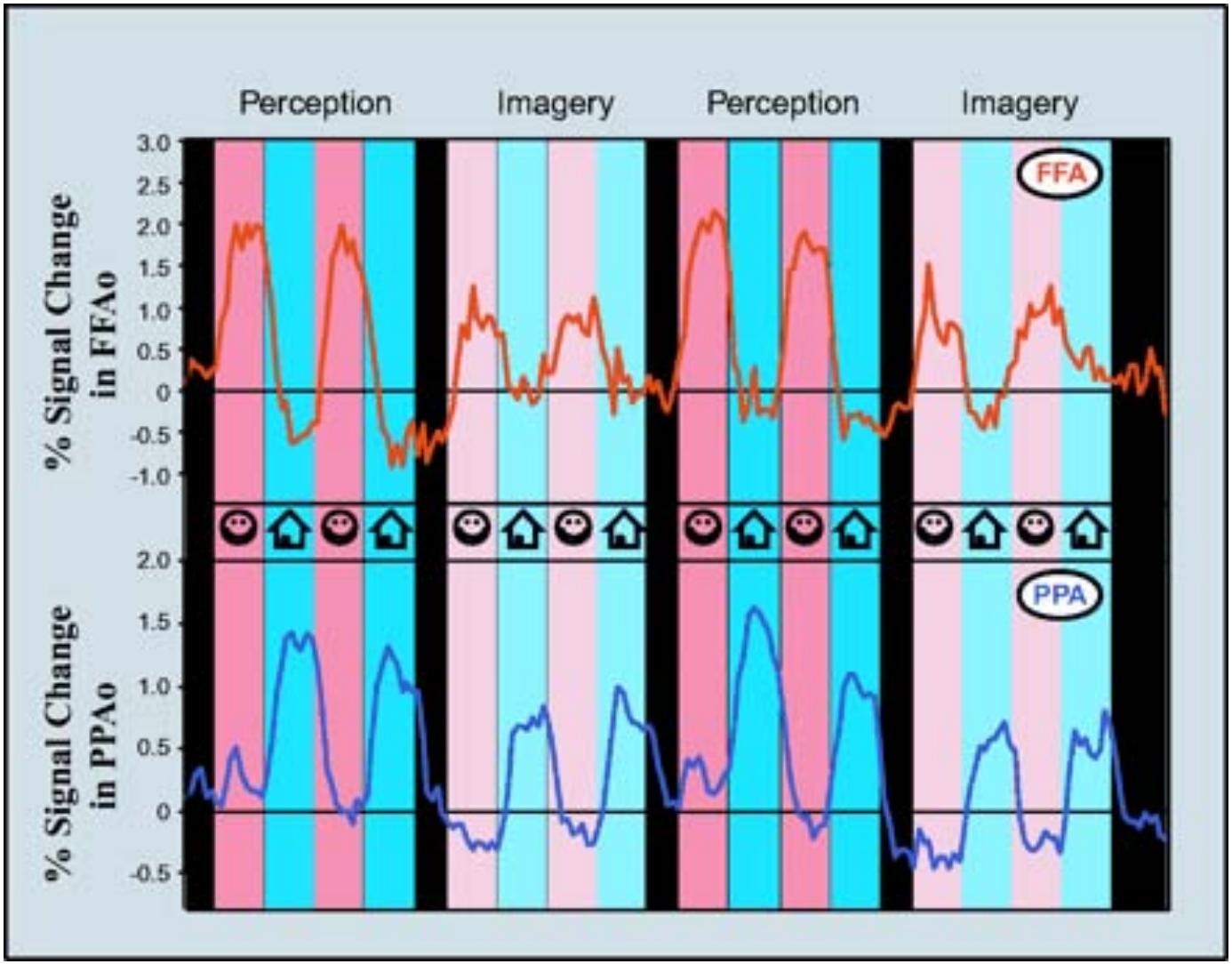
- **Faces**
 - **face processing as a slowly learned and highly specific skill**
 - **inversion effects**
 - **fusiform specialization for faces**
 - **overlap in brain between seeing and imagining a face**
 - **same-race memory superiority for faces**

FACES

Faces - slowly learned expertise

- **face inversion**
- **development - age 16**
- **dog-show judges - 8 years to develop face-inversion for dog faces**

Overlap of Perception & Imagination in the Brain

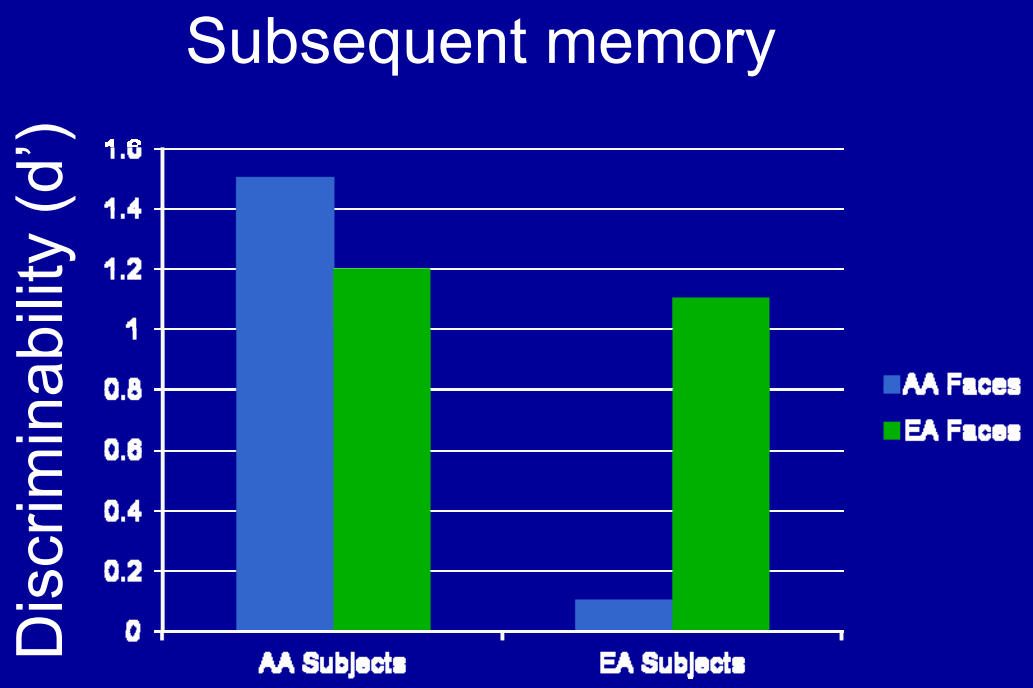


Courtesy of Journal of Cognitive Neuroscience. Used with permission.



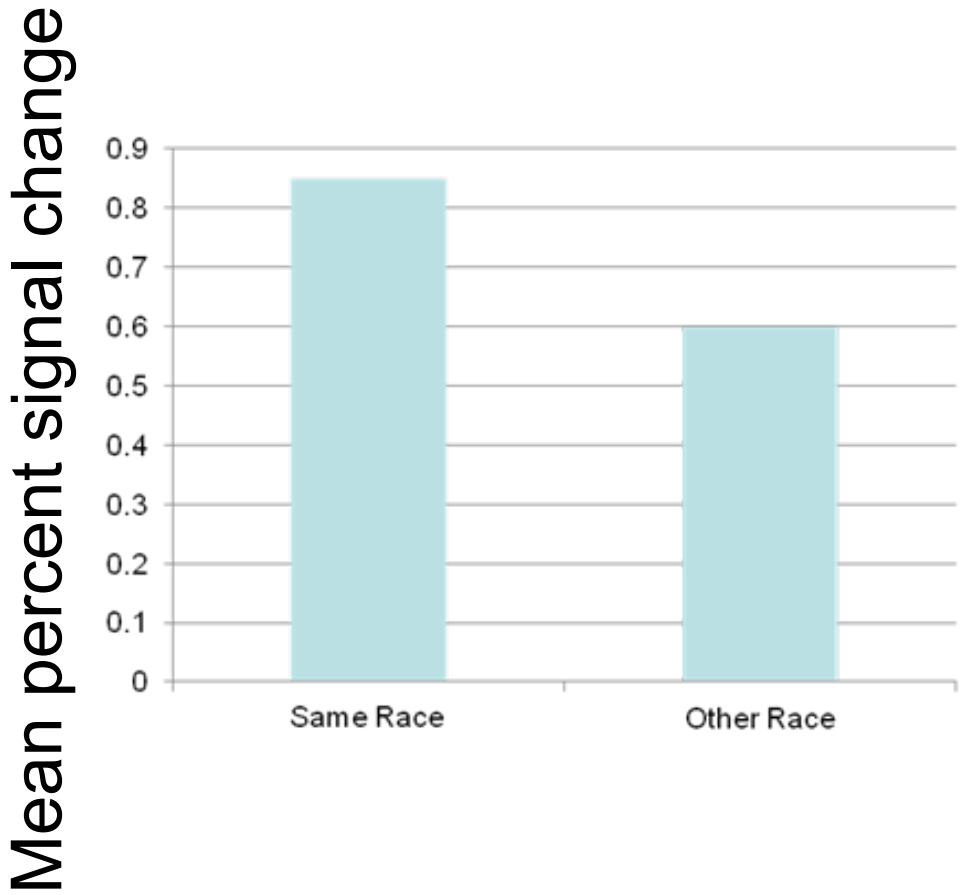
Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience. Source: Phelps, Elizabeth. "Faces and Races in the Brain." *Nature Neuroscience* 4 (2001): 775-6. © 2001.

Superior Memory for Same-Race Faces

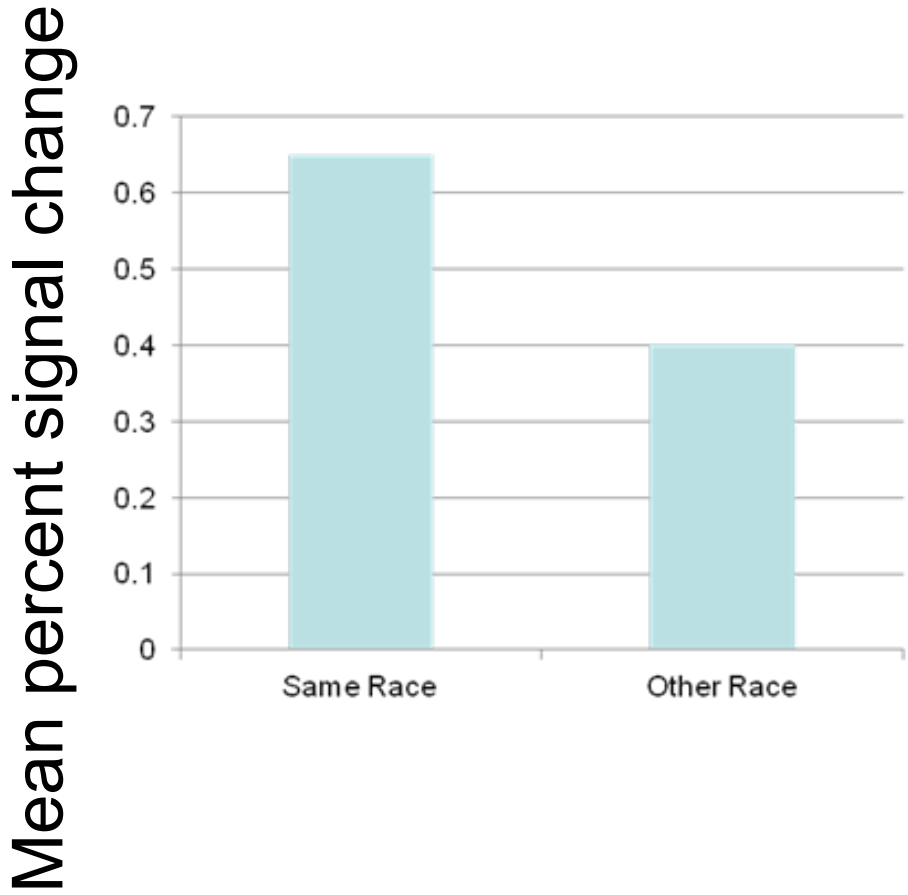


GREATER FFA ACTIVATION FOR OWN THAN OTHER RACE

FFA activation
(defined $p < 0.0001$)



FFA activation
(defined t=2)



FACES

Development of Same-Race Bias

- **not present at birth (and no species preference)**
- **present by 3 months**
- **Korean children 3-9 years old adopted by European Caucasian families - better memory for Caucasian faces, same as French children, opposite of Korean children**

FACES

- Identity
- Expression (feelings)
 - six universal facial expressions
 - amygdala & fear
 - amygdala and recognition of fearful facial expressions

Fear & The Amygdala



Fear

Photo courtesy of artindeepkoma on Flickr.

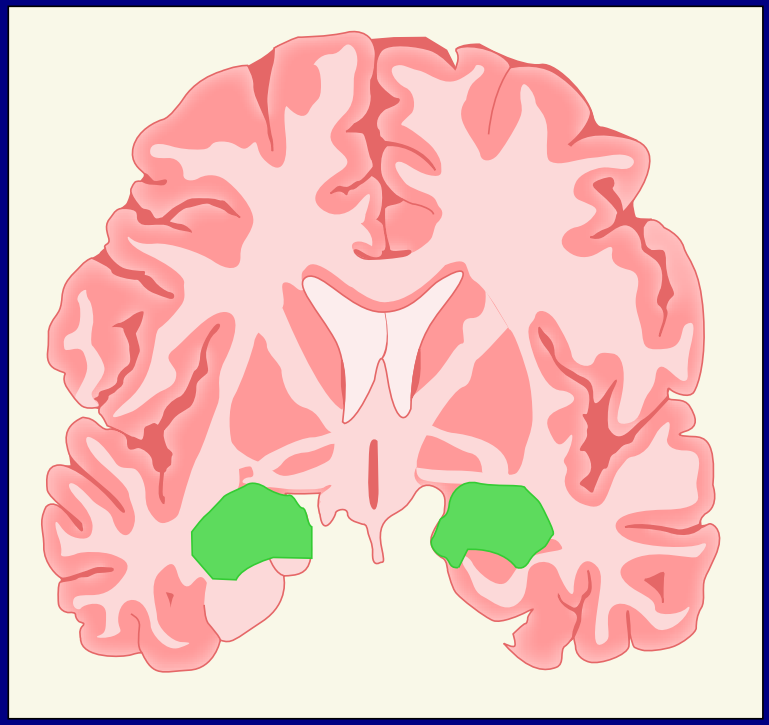


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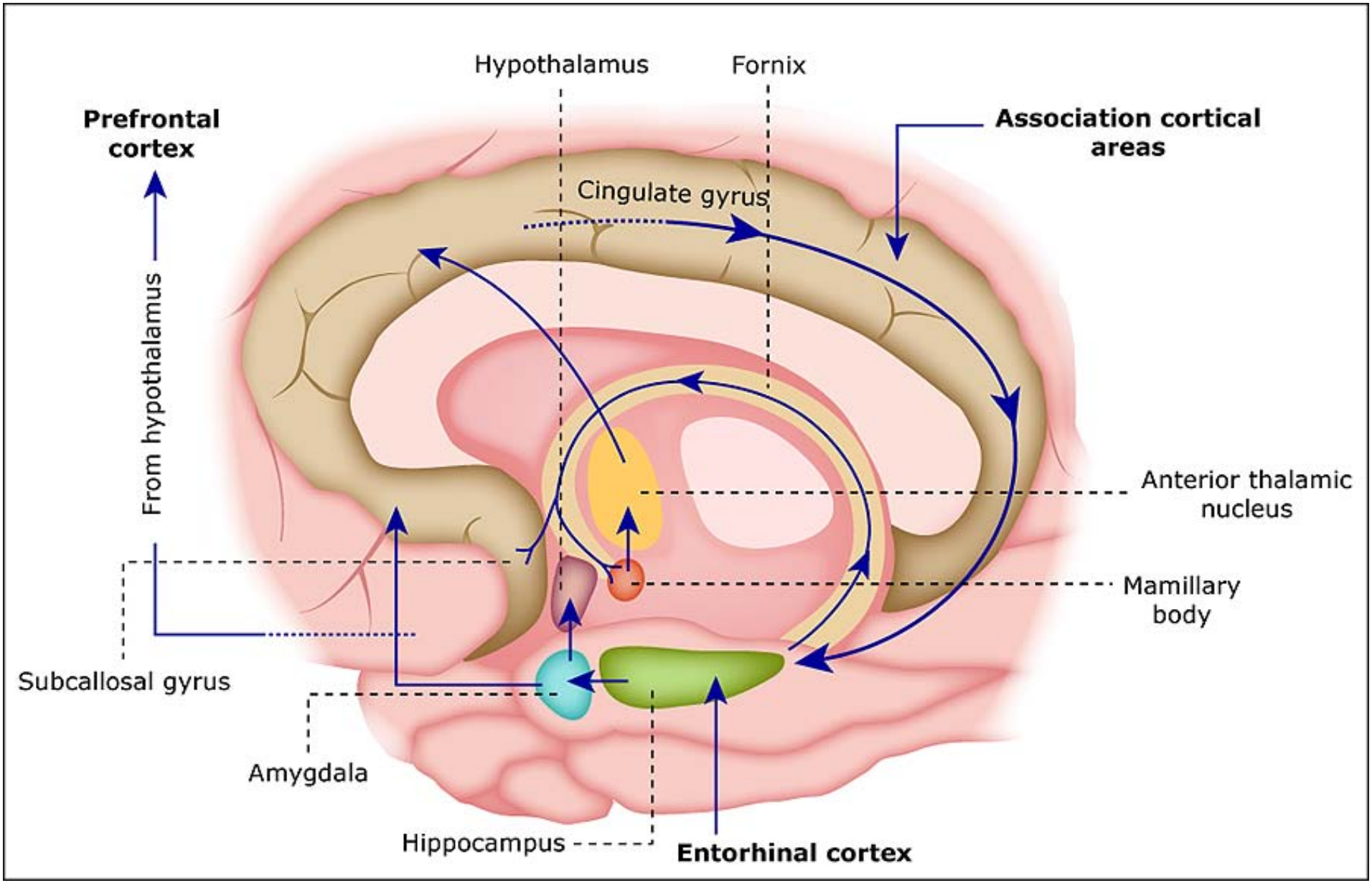


Image by MIT OpenCourseWare.

Selective amygdala lesions: Rodents

- Direct implication of amygdala in emotional behaviors

Cute & Cuddly or fearsome predator?



Courtesy of American Psychological Association. Used with permission. Source: Blanchard, D., and R. J. Blanchard. "Innate and Conditioned Reactions to Threat in Rats with Amygdaloid Lesions." *Journal of Comparative and Physiological Psychology* 81, no. 2 (1972): 281-90.

Human amygdala: Impaired recognition of fear

- Intact face recognition
- Impairment selective for fear

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9.00 Lecture -- Attention

John Gabrieli

What is *attention*?

- **"Everyone knows what attention is. It is the taking possession by the mind in clear and vivid form of one out of what seem several simultaneous objects or trains of thought… It implies withdrawal from some things in order to deal with others."**

- William James, 1890

ATTENTION

- awareness/consciousness
- we often attend to more than we realize
- we often attend to less than we realize

ATTENTION & CONSCIOUSNESS

1. Attention as gatekeeper to perception and knowledge
2. Attention is very limited - one thing at a time

 (we miss a lot)
3. Unconscious/Unattended processes

 (do things we not notice influence us?)
4. Some external stimuli “capture” our attention - “bottom-up” processing
5. Some internal thoughts & goals direct our attention - “top-down” processing

Selective Visual Attention

Somewhere Among hidden the in most the spectacular Rocky Mountains cognitive near abilities Central City is Colorado the an ability old to miner select hid one a message box from of another. gold. We Although do several this hundred by people focusing have our looked attention for on it, certain they cues have such not as found type it or yet style.

Attention and Auditory Awareness

- **Dichotic Listening/Shadowing Demo**

SHADOWING & ATTENTION
(Cherry, 1953)

- **left ear - shadowed message**
- **right ear - second message**

What could be heard in unattended ear?

- **if a voice is present**
- **voice changes from man to woman**
- **voice becomes a tone**

What was <u>not</u> heard in unattended ear?

- **content of message**
- **language of message**
- **change in language of message**
- **speech vs. nonsense backward speech**

SHADOWING & ATTENTION

(Cherry, 1953)

Paradox of cocktail party effect:

How can we notice something we do not attend to?

SHADOWING & ATTENTION

(MacKay, 1973)

- **shadowed ear**
 "The man approached the bank."
- **other ear**
 "money" **or** ***"river"***

paraphrase

"The man went to the savings and loan association"
"The man went to the side of the river"

(Eich, 1984)

- **shadowed ear**
 essay
- **other ear**
 taxi fare (fair)

	Attended		Unattended
Recognition	88 %	12%	
Spelling Bias	40%		41%

SHADOWING & ATTENTION

(Cherry, 1953)

Paradox of cocktail party effect:

How can we notice something we do not attend to?

some kinds of information are processed automatically/ without attention

ATTENTION & CONSCIOUSNESS

1. Attention as gatekeeper to perception and knowledge
2. Attention is very limited - one thing at a time

 (we miss a lot)
3. Unconscious/Unattended processes

 (do things we not notice influence us?)
4. Some external stimuli “capture” our attention - “bottom-up” processing
5. Some internal thoughts & goals direct our attention - “top-down” processing

A Penny for Your Thoughts

Attention and Memory

- **Less than half the participants thought the correct version of the penny was even a *plausible* answer.**

- **Without attention, learning is very hard, even with many, many exposures.**

ATTENTION

- ***controlled*** **or** ***top-down***

conscious, effortful, selective, focused

goal driven

demands a lot of attention

- ***automatic*** **or** ***bottom-up***

unconscious, easy

stimulus-driven

demands little or no attention

Stroop Effect

Word Set #1



Name the words – easy, automatic reading

Word Set #2



Name the color of the PRINT – harder because of conflict between automatic reading process and controlled print naming

HYPNOSIS & STROOP EFFECT

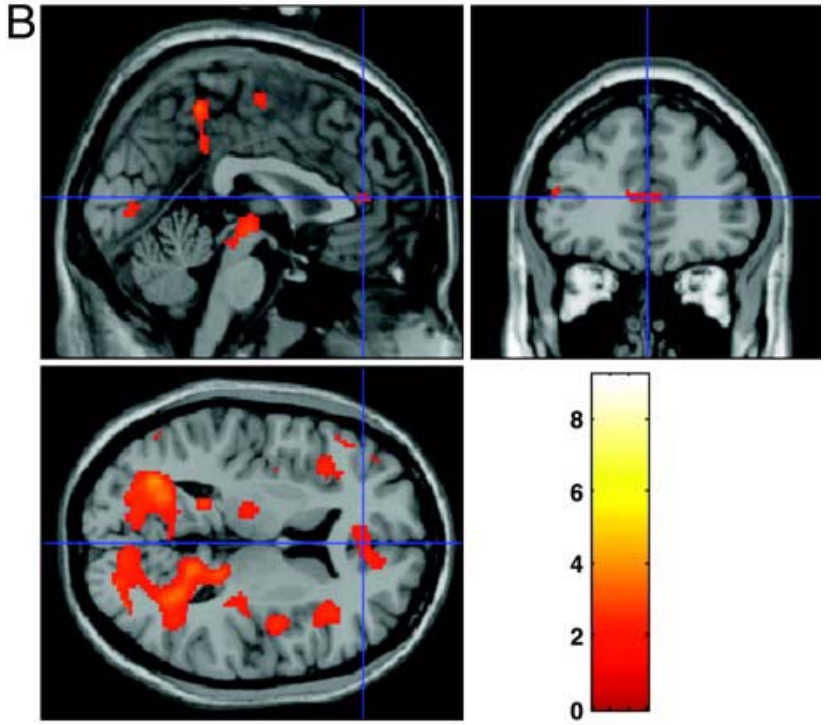
- Raz et al, 2008
- high & low hypnotizeable subjects
- perform normally
- meaningless characters in a foreign language you do not know
- interference

low subjects - 104 msec, 121 msec (hyp)

- high subjects - 157 msec, 5 msec (hyp)

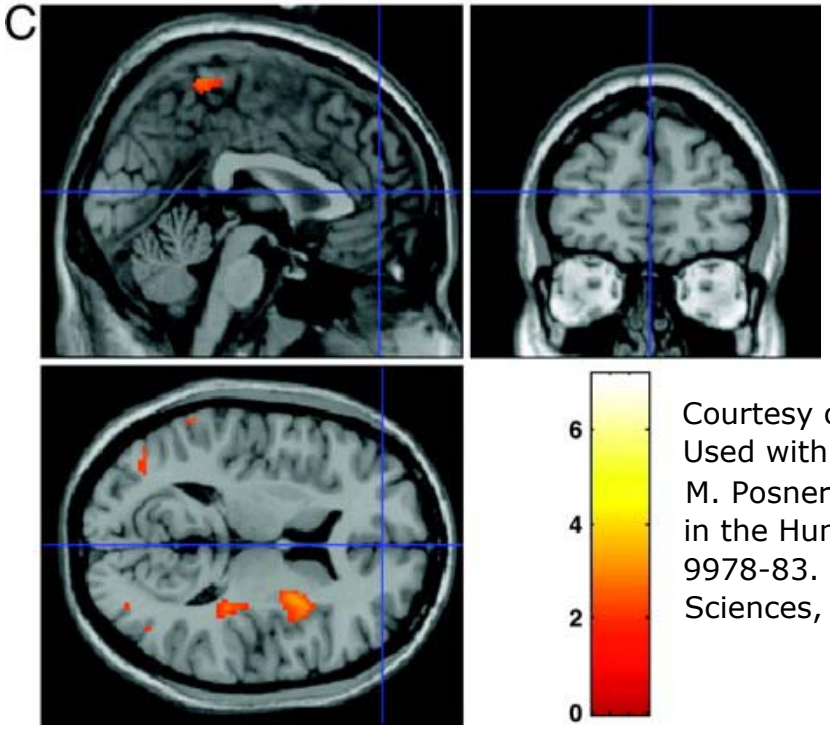
High-Hypnosis Subjects

No Hypnosis Activation for Incongruent > Congruent



High-Hypnosis Subjects

Hypnosis Activation for Incongruent > Congruent



Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Raz, A., J. Fan, and M. Posner. "Hypnotic Suggestion Reduces Conflict in the Human Brain." *PNAS* 102, no. 28 (2005): 9978-83. Copyright © 2005 National Academy of Sciences, U.S.A.

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ATTENTION

- ***controlled*** **or** ***top-down***

conscious, effortful, selective, focused

goal driven

demands a lot of attention

- ***automatic*** **or** ***bottom-up***

unconscious, easy

stimulus-driven

demands little or no attention

Visual Search

- ***is there a red X in the display?***

Features & Conjunctions

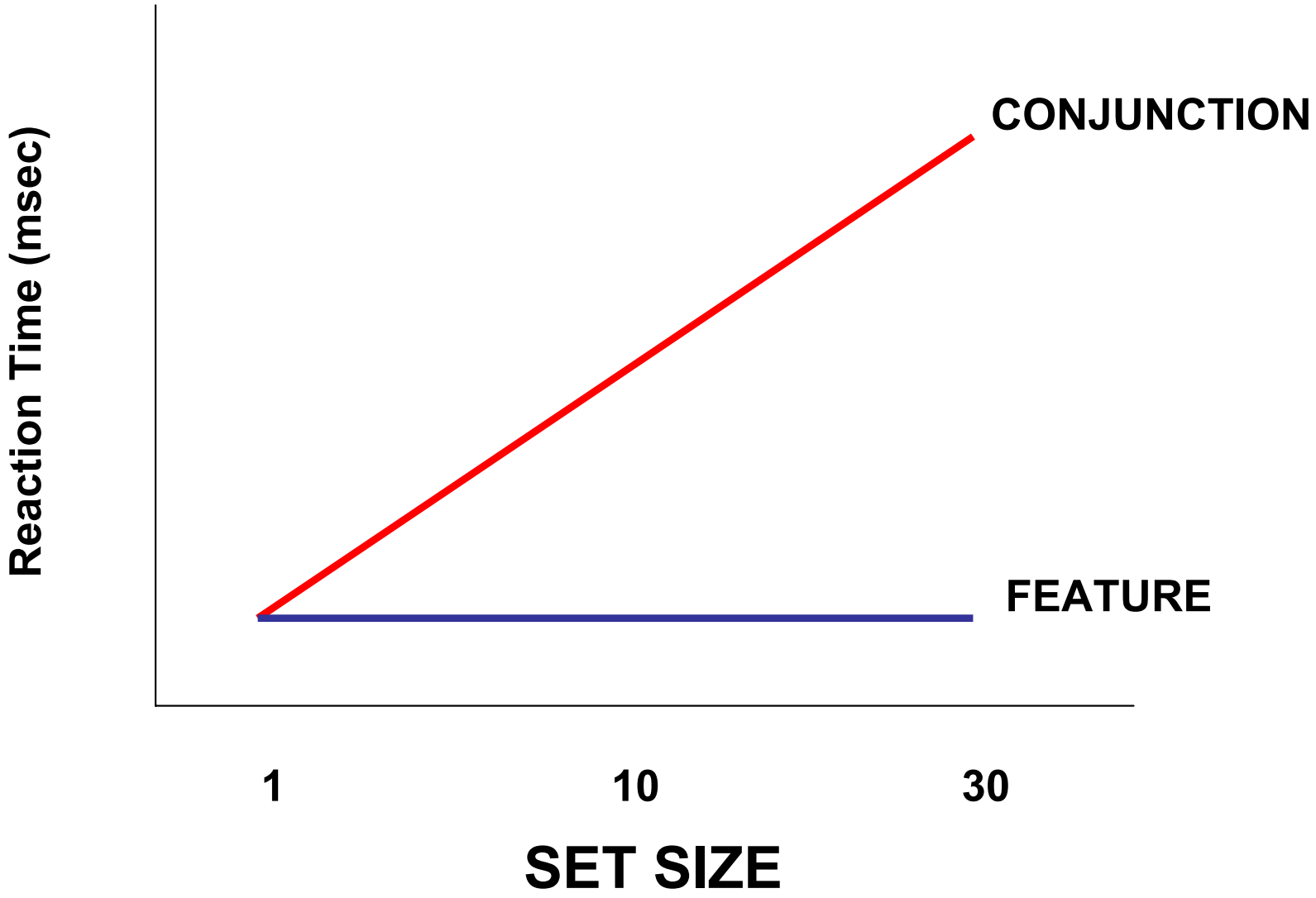
- ***Features - defined by one dimension***

 shape (X,O), color (black, red)

- ***Conjunctions - defined by co-occurrence of two dimensions***

 X O X O

TWO KINDS OF VISUAL SEARCH



TWO KINDS OF VISUAL SEARCH

Preattentive	Attentive
features	conjunctions
parallel	serial
pop-out	no pop-out
flat slope	steep slope

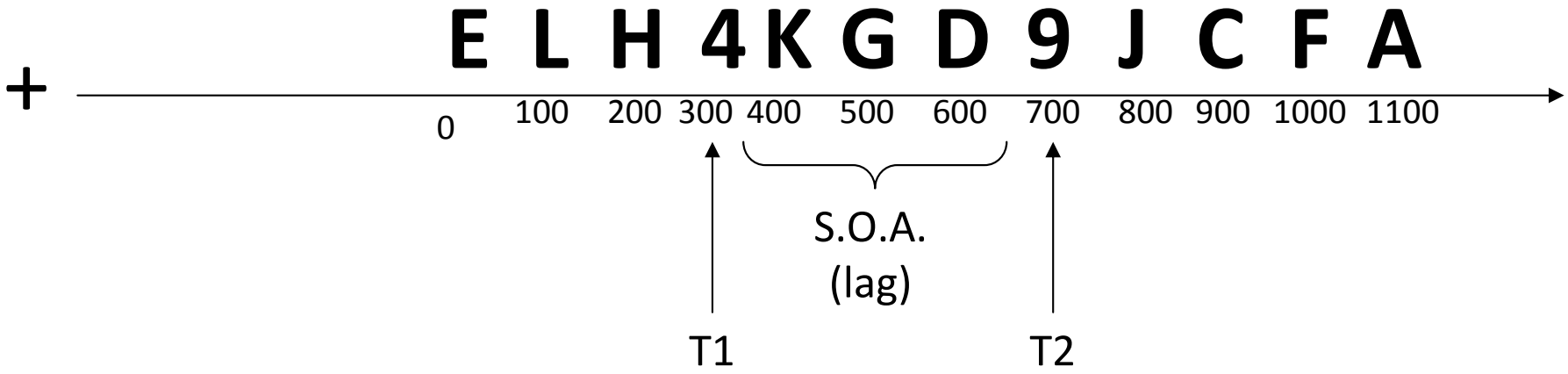
ILLUSORY CONJUNCTIONS

Controlled attention binds features into coherent perceptions

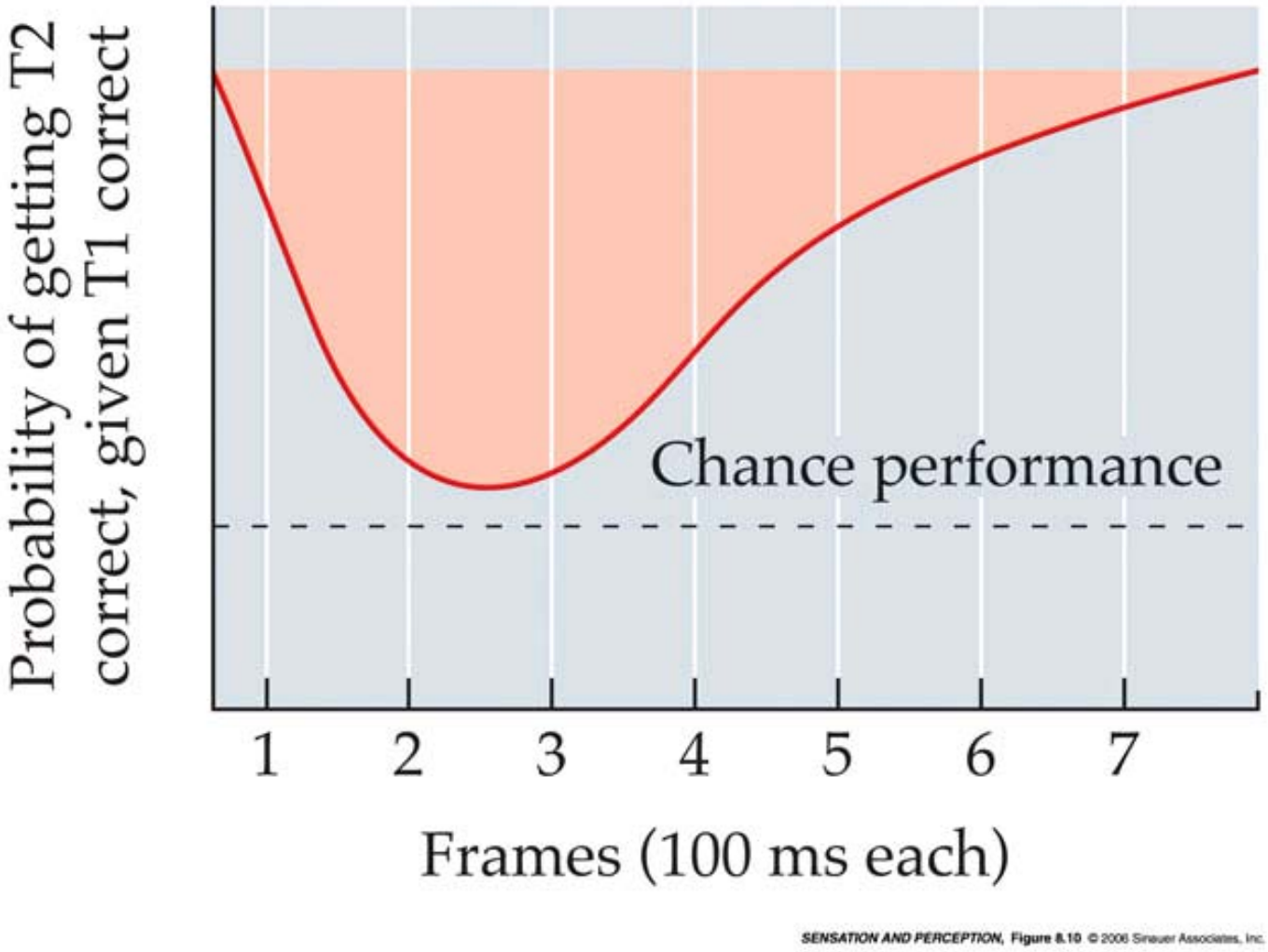
Limits of Attention

- **Attention is a very constrained resource.**
 - **Temporal constraints**

Attentional Blink



Attentional Blink



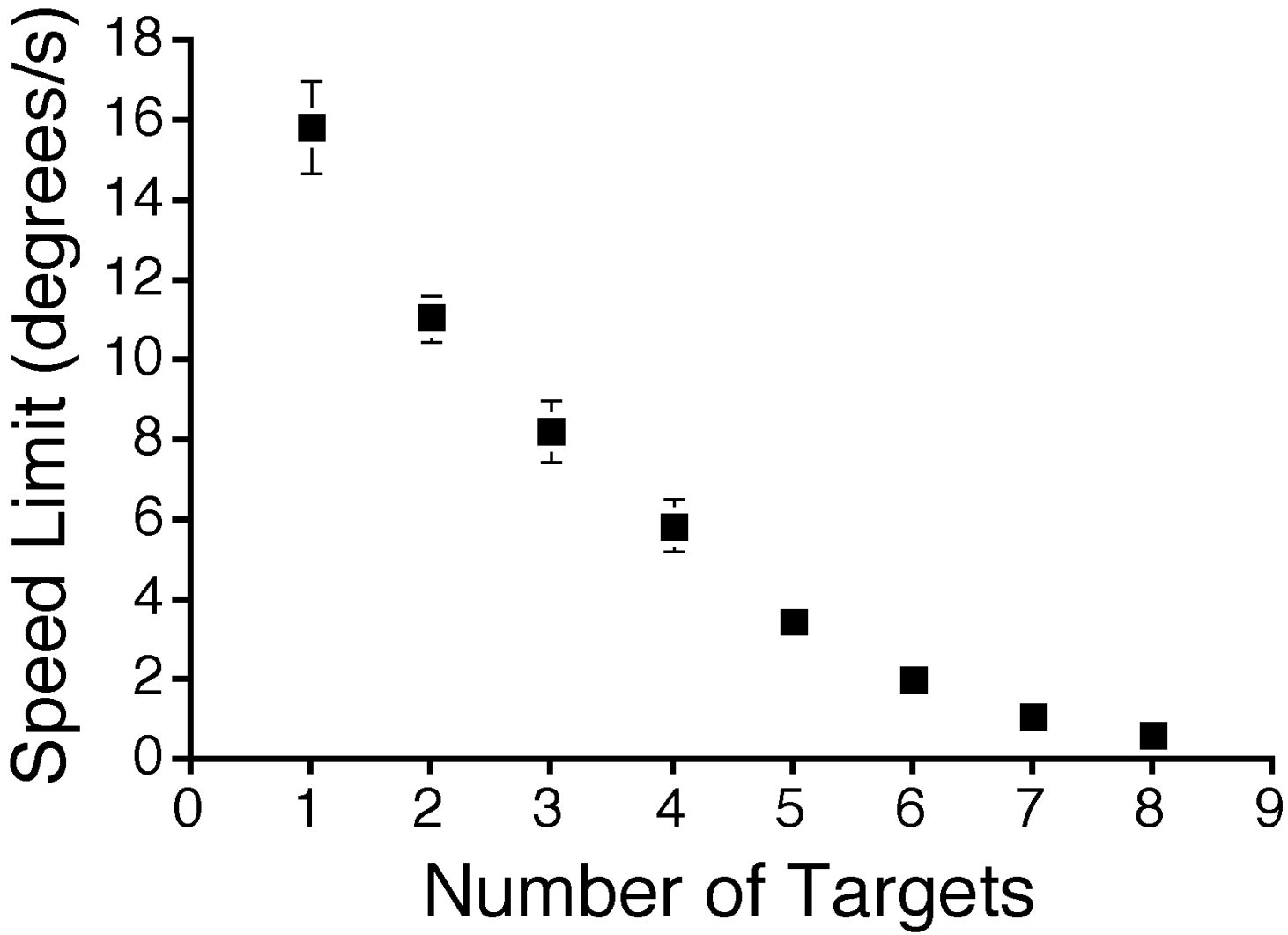
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Limits of Attention

- **Attention is a very constrained resource.**
 - **Temporal and spatial constraints**

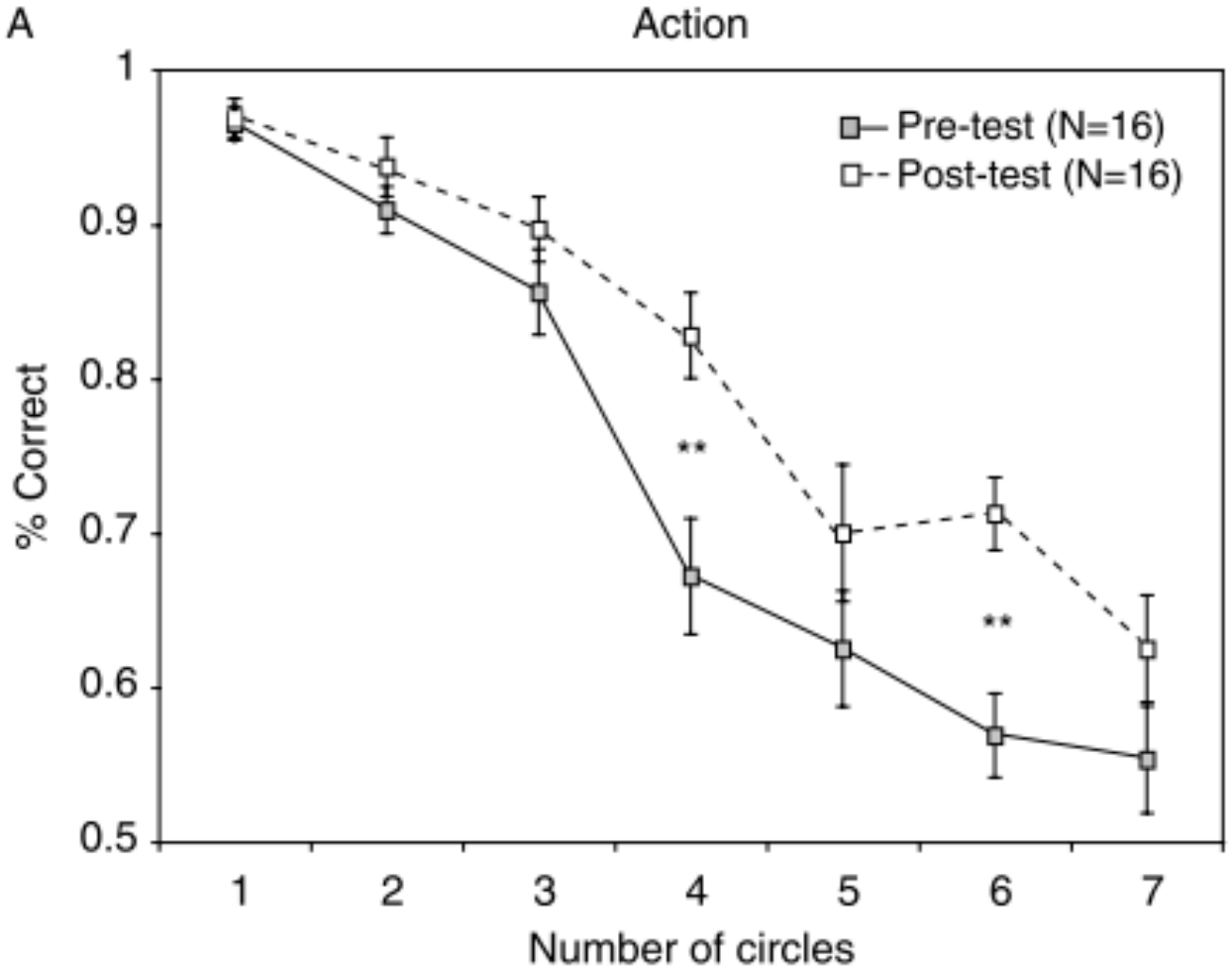
Multiple Object Tracking



How many targets can be accurately tracked

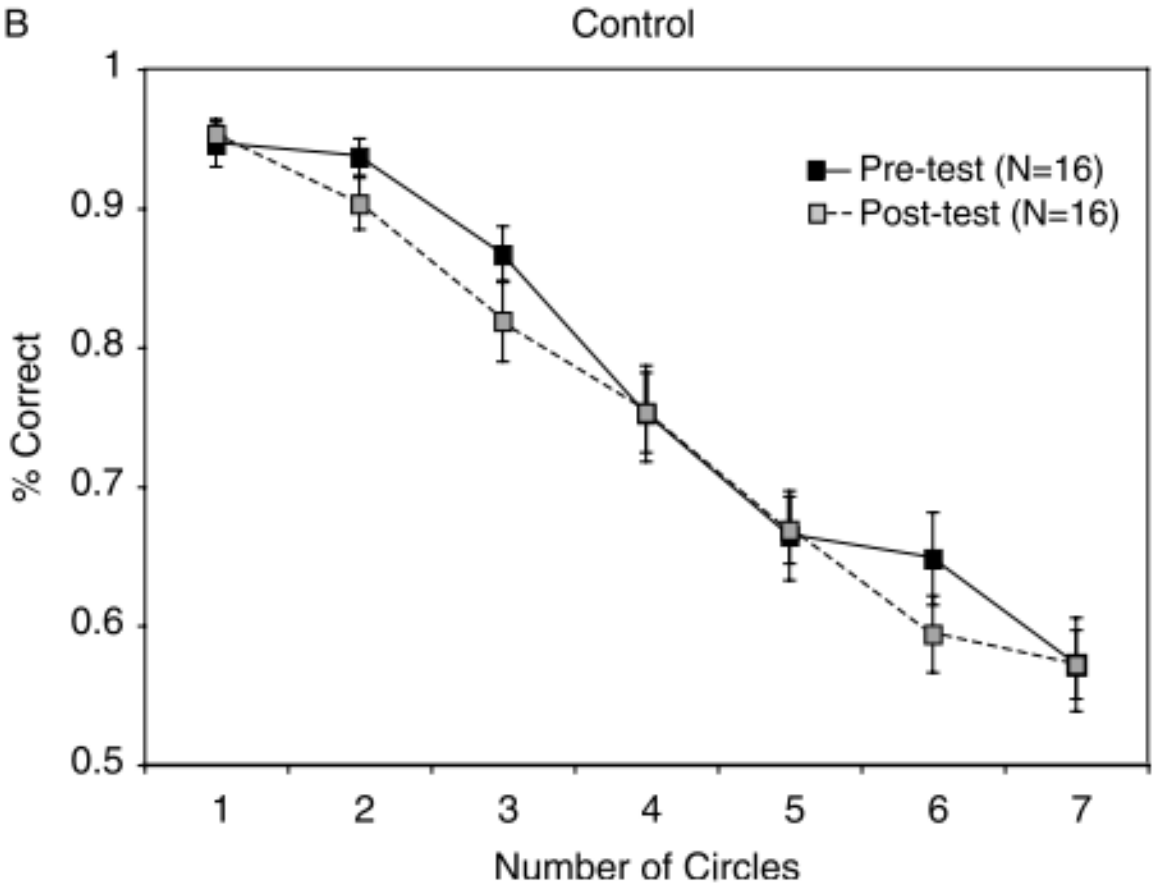
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Number of Objects Tracked after 30h of Action Video Game training



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Number of Objects Tracked in Control Group (Tetris) (No Improvement)



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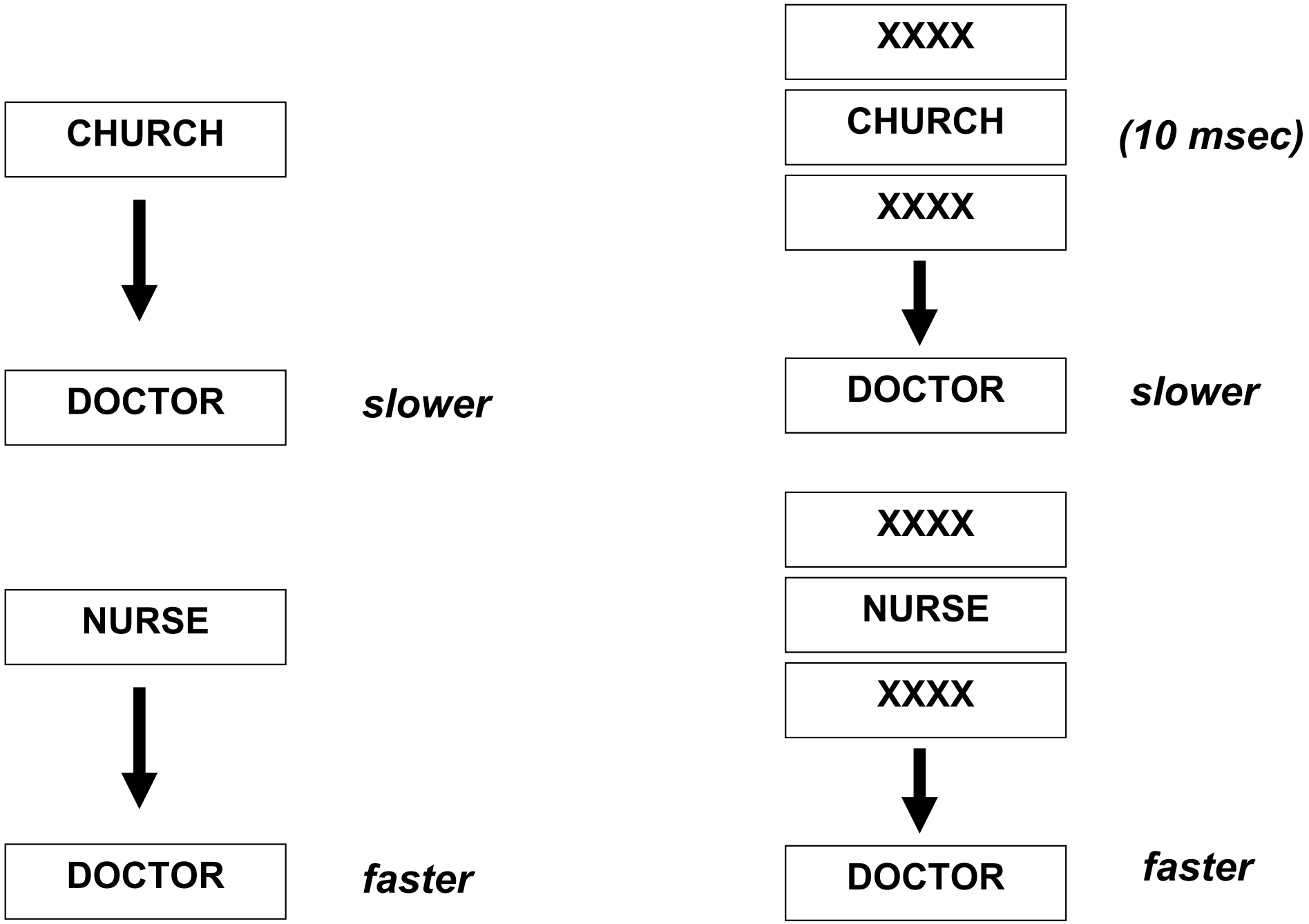
Subliminal Perception

- **Can non-attended stimuli still influence our actions?**

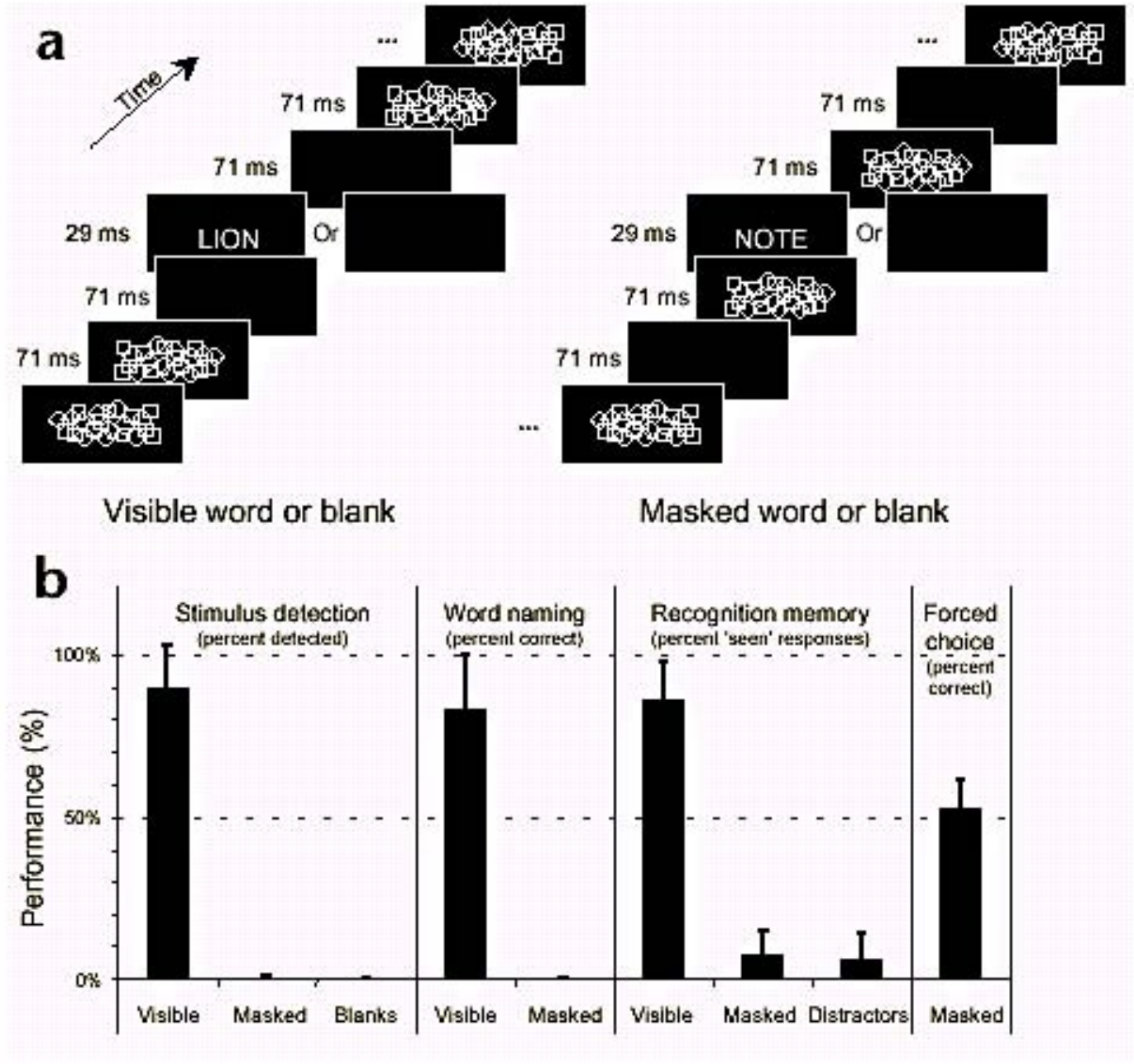
KNOWING WITHOUT SEEING

SUBLIMINAL PERCEPTION

KNOWING WITHOUT SEEING
SUBLIMINAL PERCEPTION

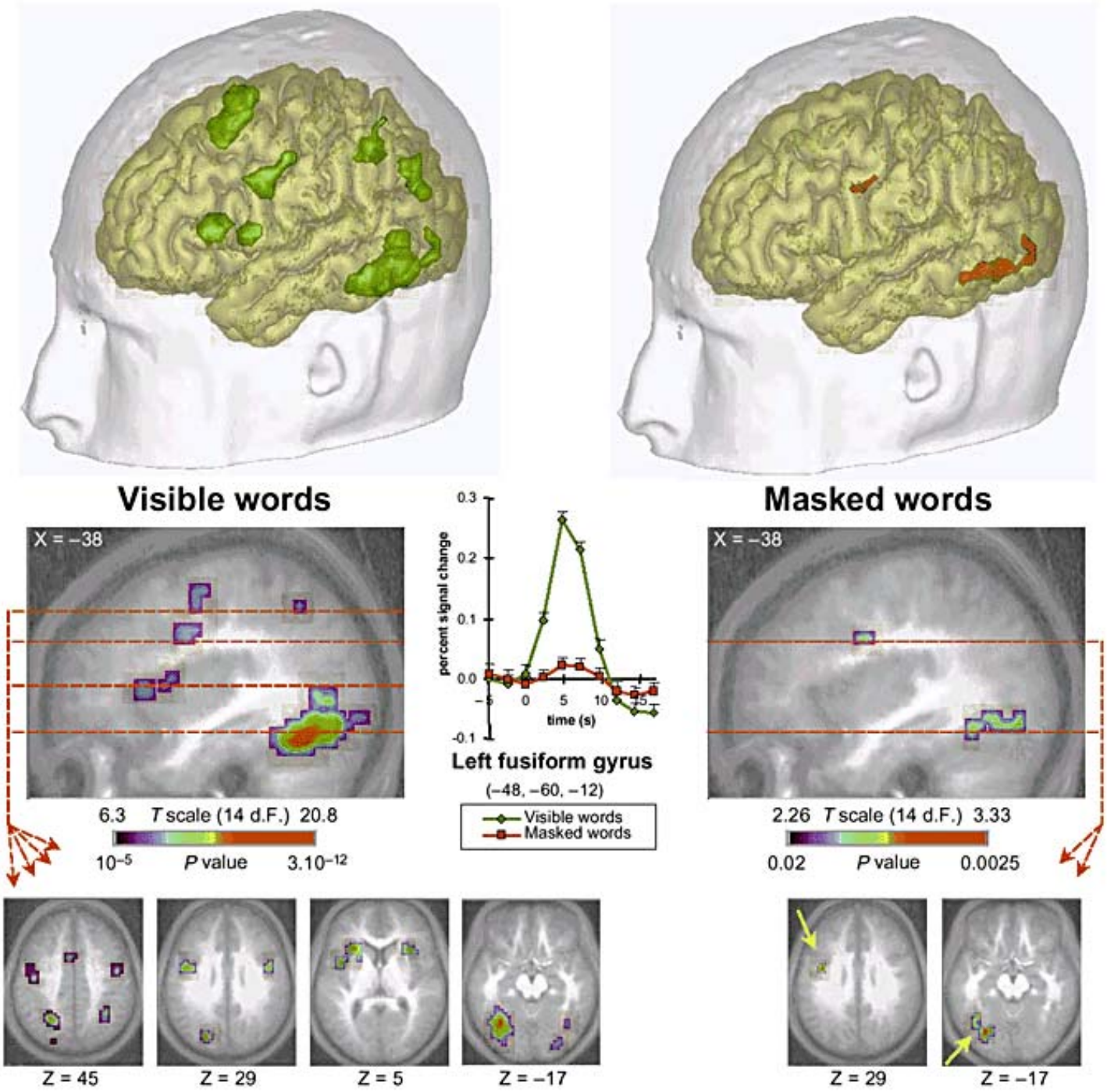


DESIGN AND BEHAVIORAL RESULTS



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fMRI



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9.00 BLINDSIGHT & NEGLECT

Professor John Gabrieli

Objectives

- ***Blindsight***
 - **what it is**
 - **brain basis**
 - **unconscious perception**
- ***Neglect***
 - **what it is**
 - **brain basis**
 - **construction of visual attention**

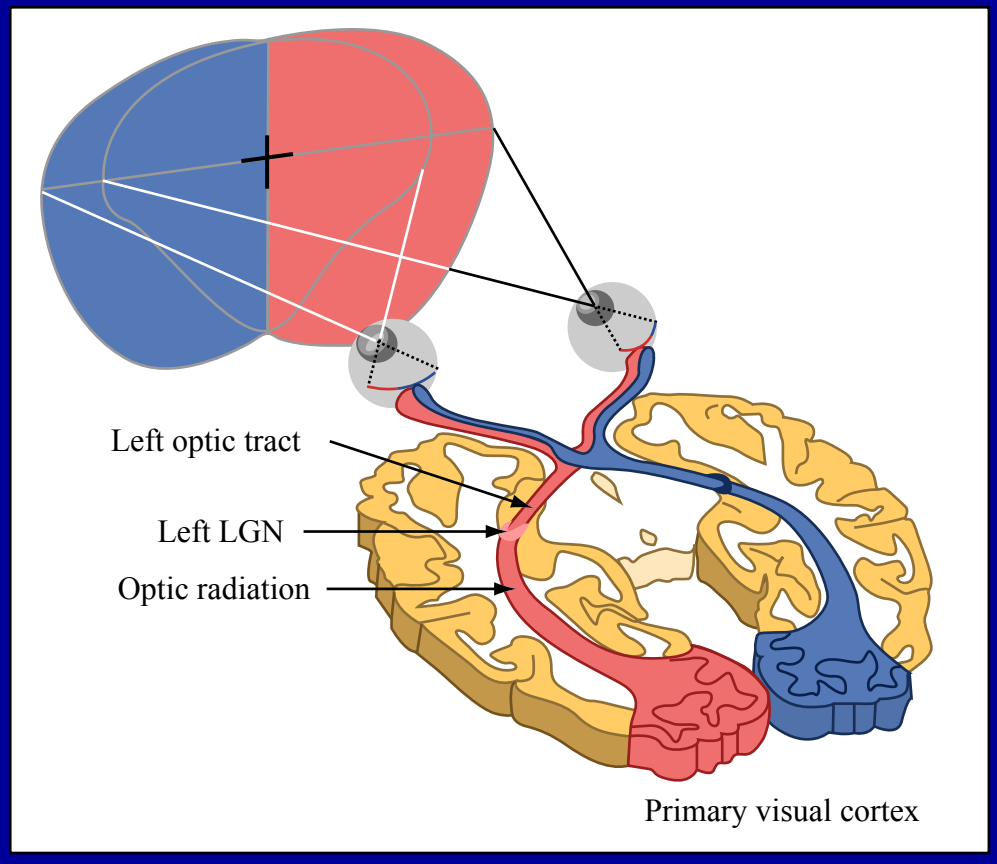


Image by MIT OpenCourseWare. After Figure 10-4b in Bear, Mark F., Barry W. Connors, and Michael A. *Paradiso. Neuroscience: Exploring the Brain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins, 2007. ISBN: 9780781760034.

Blindsight & Tectopulvinar Visual System

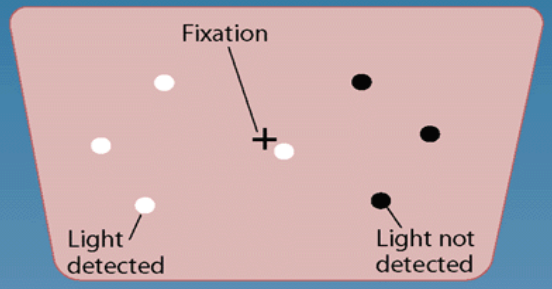
Sensation without perception

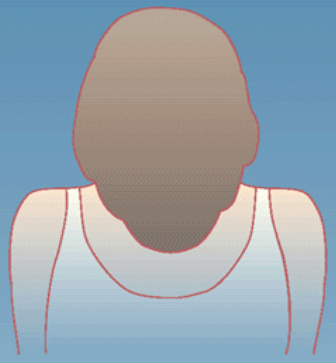
Three subcortical retinal projections:

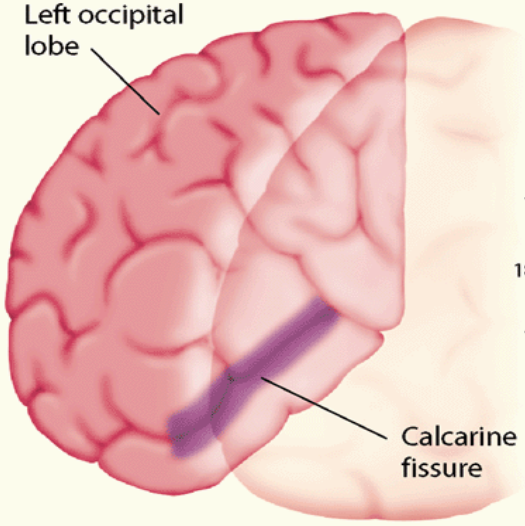
- **pretectal area of midbrain controls pupillary reflexes**
- **lateral geniculate nucleus & *geniculostriate system* (90%)**
- **superior colliculus & *tectopulvinar system***

What is not done by the *geniculostriate system* ?

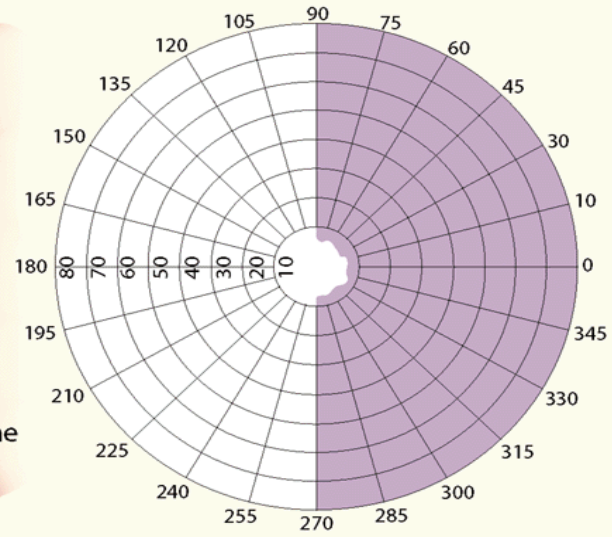
- consequence of unilateral or bilateral occipital lesions
- Munk (1881) dogs with bilateral occipital lesions avoided obstacles in path that they failed to recognize
- monkeys with complete visual cortex ablations recover ability to do spatial localization, orientation detection, very simple shape discrimination



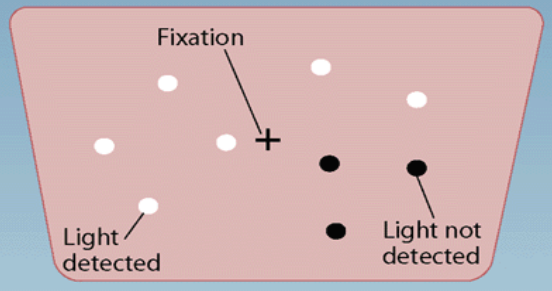


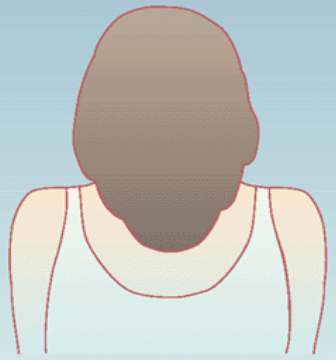


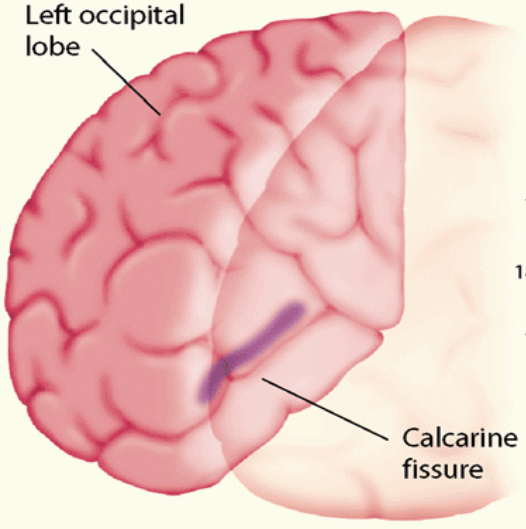
Lesion of superior and inferior banks of calcarine fissure



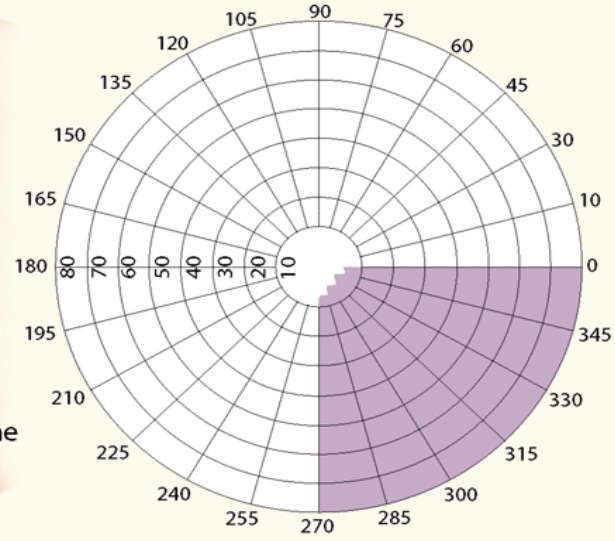
Hemianopia (note spared foveal vision in right visual field)







Lesion of superior bank of calcarine fissure

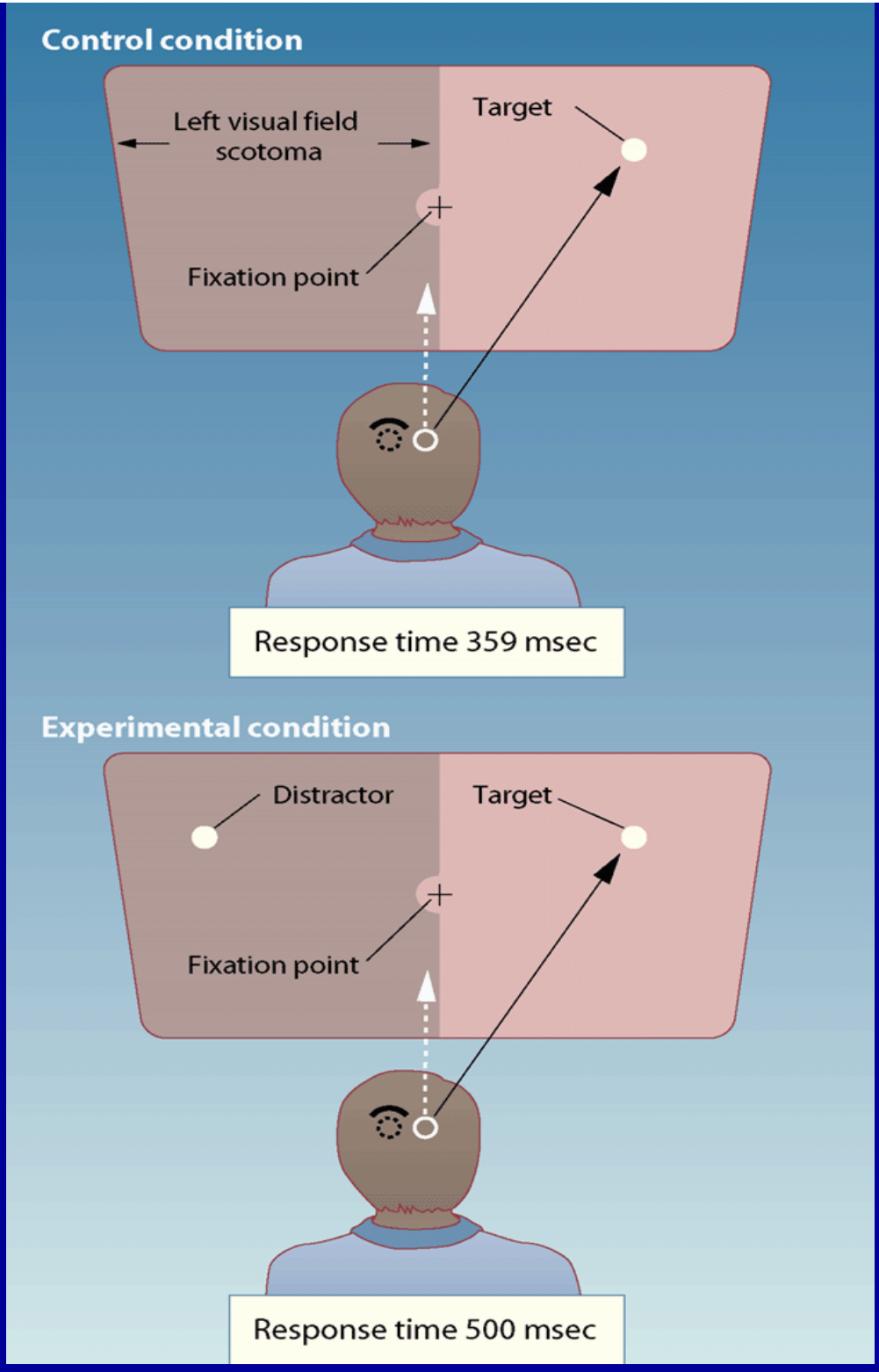


Quadrantanopia

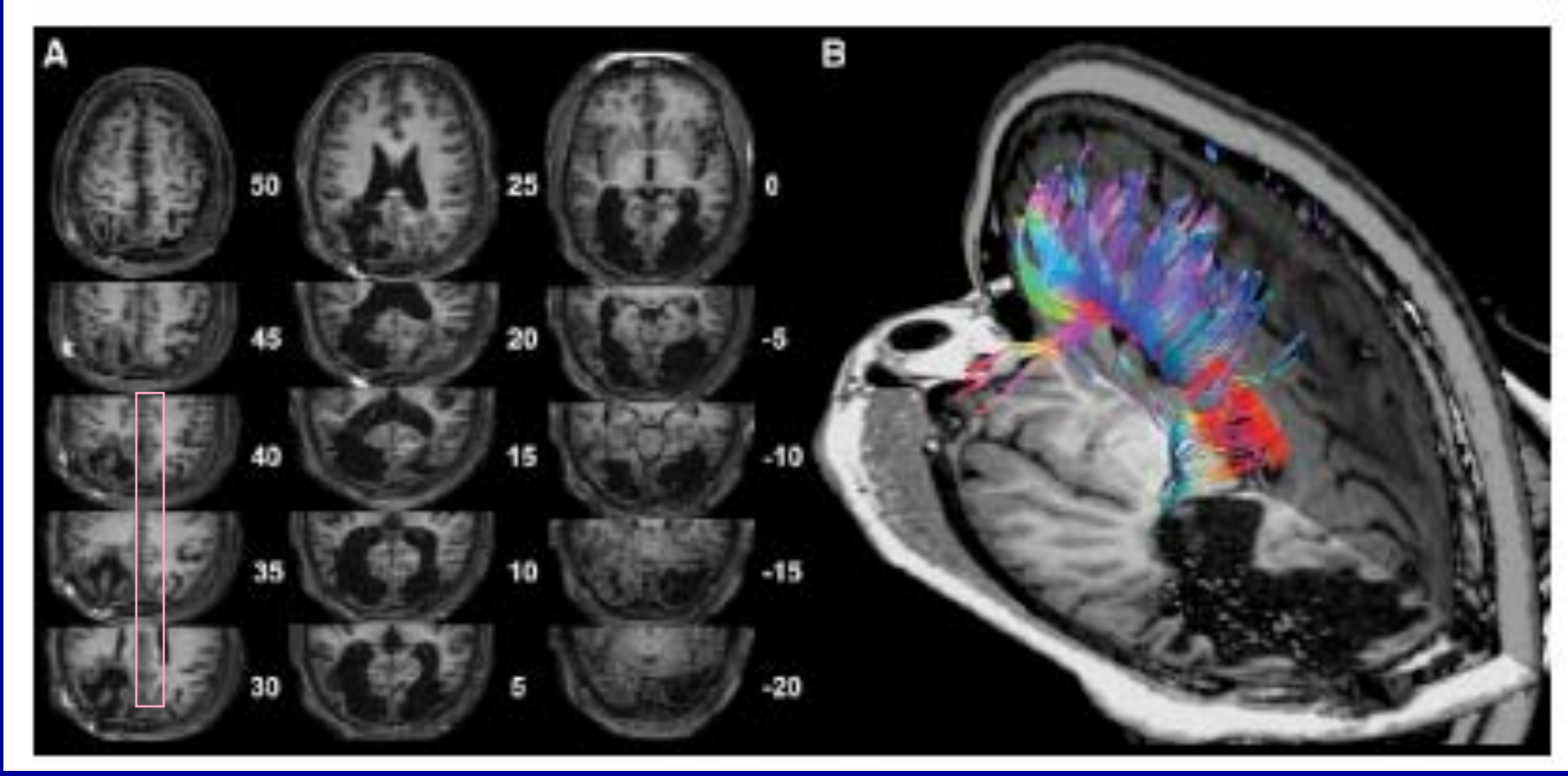
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G. Mangun, and R. Ivry. *Cognitive Neuroscience: The Biology of the Mind*. W. W. Norton.

Blindsight

- Patient DB (Weiskrantz) –
 - arteriovenous malformation in right occipital pole
 - right visual cortex removed
 - tested in blind region by dynamic perimetry
 - LVF scotoma
 - light flash, move eye toward light
 - tendency to move eye toward correct spot
 - reaching was more accurate
- better than chance in LVF guesses about presence/absence of small patches of light, orientation of lines
- 97% accurate at discriminating long from short line with exposure as short as 100 msec
- could discriminate circle/cross and X/O - 90% accurate
- could not do square/rectangle discrimination


Control condition
Left visual field scotoma
Target
Fixation point
Response time 359 msec
Experimental condition
Distractor
Target
Fixation point
Response time 500 msec

Patient TN: Left and Right Occipital Strokes 36 Days Apart



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CONSCIOUS & UNCONSCIOUS VISION IN MONKEYS

Are monkeys with occipital lesions also "unconscious" of visual stimuli in blindsight?

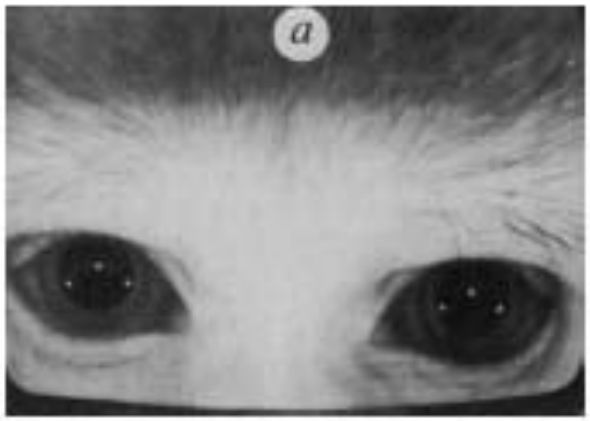
1 intact monkey

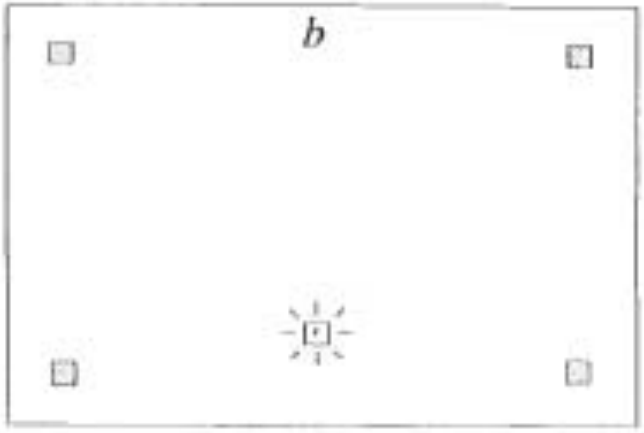
3 monkeys with ablation of left striate cortex and of splenium of corpus callosum

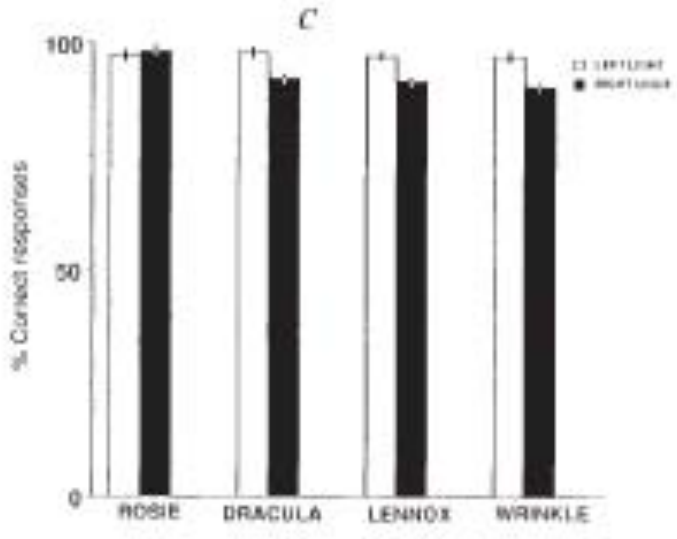
task 1 - touch position where a light comes on – blind animals good in both fields

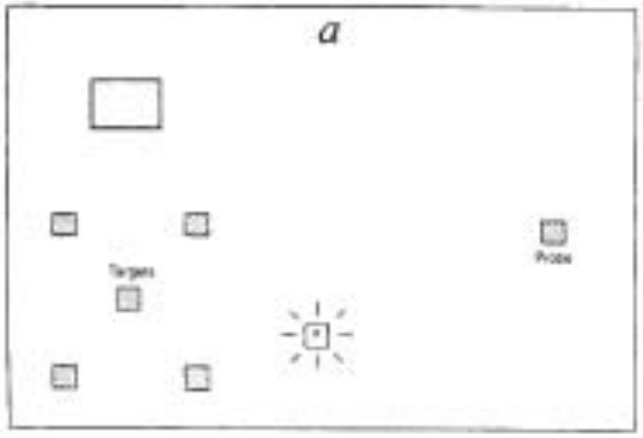
task 2- half the trials had one of five target illuminated - for blank trials, press large rectangle

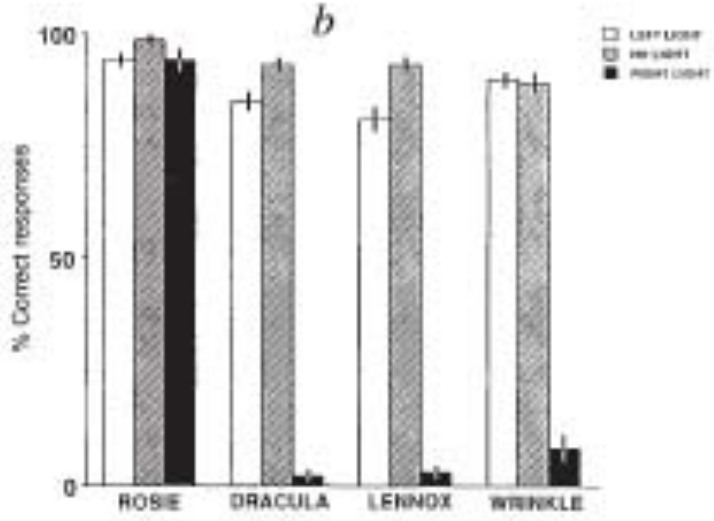
what happens on probe trials in blind field? treated as blank



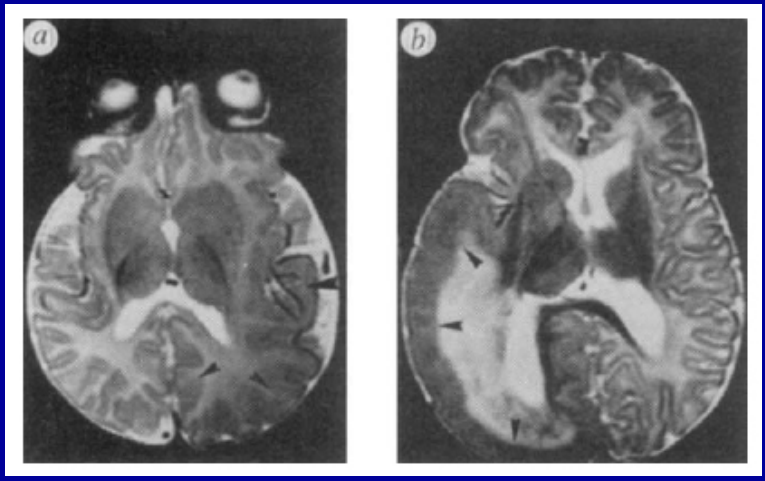








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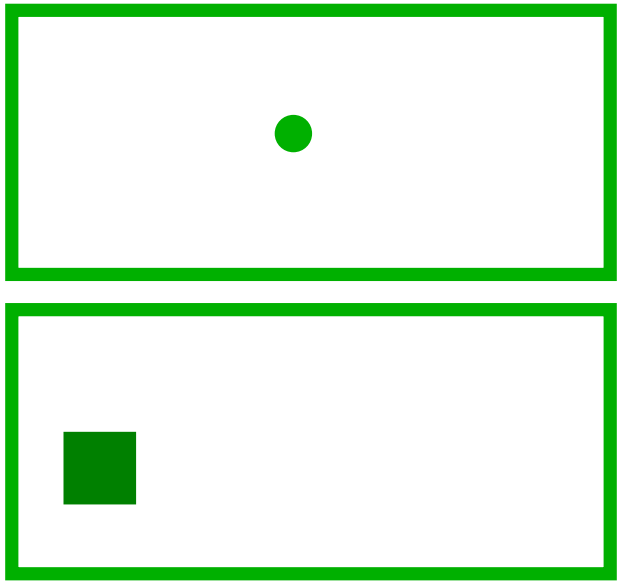


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- **two infants with hemispherectomies in first year - single, conspicuous targets in blind vf elicited fixations**
- **PP fixates on central stimulus - stimulus comes on in lvf or rvf - in "competition" condition central fixation stays on**
- **growth of conscious visual system?**

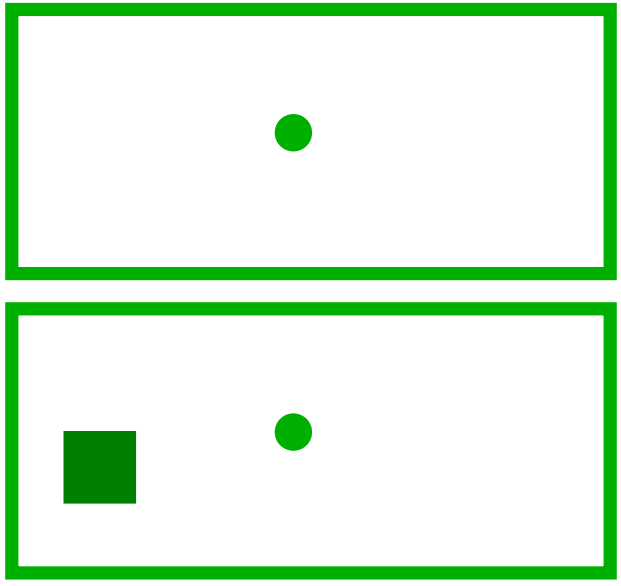
Non Competition

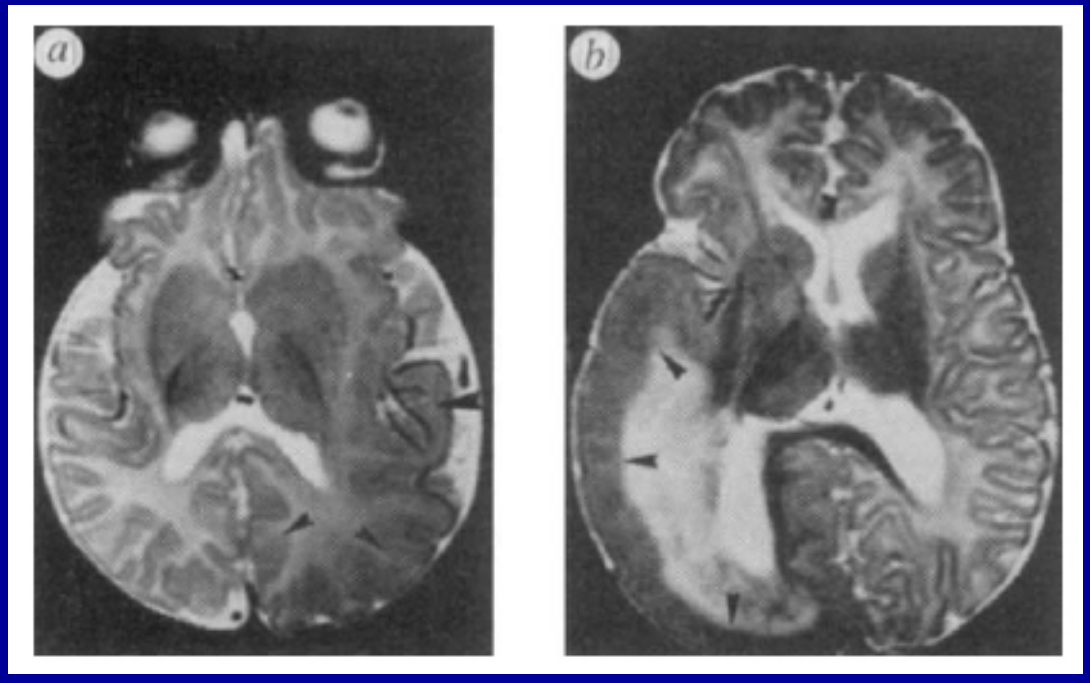
Blind LVF



Intact RVF

Competition

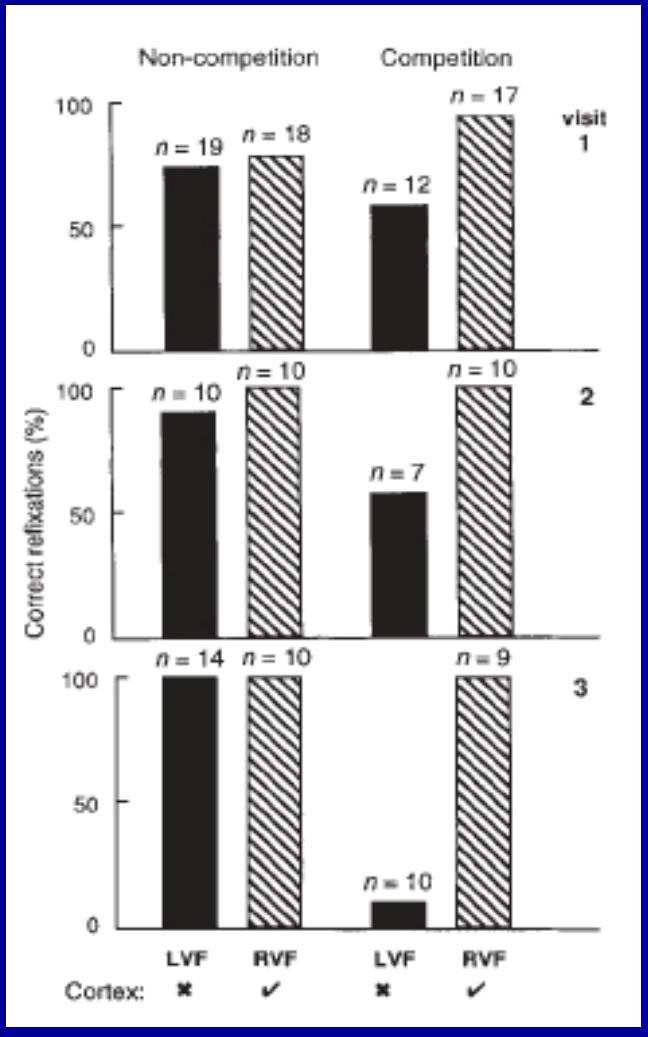




goes off

Central Target

stays on



8 weeks

10 weeks

12 weeks

Blind in LVF

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ATTENTION & NEGLECT

- Neglect
- Anosagnosia
- Measures of Neglect
- Brain Mechanism of Neglect
- Neglect of Imagined Representations
- Psychological Model of Neglect
- Rotation of Neglect
- Levels of Attention in Neglect

NEGLECT

- Failure to report, respond or orient to a stimulus presented contralateral to lesion that cannot be accounted for by elementary sensory or motor deficits - florid early on - patient may deny left half of body, dress one side, eat from one side of plate
- Extinction to double simultaneous stimulation - seen in late stages

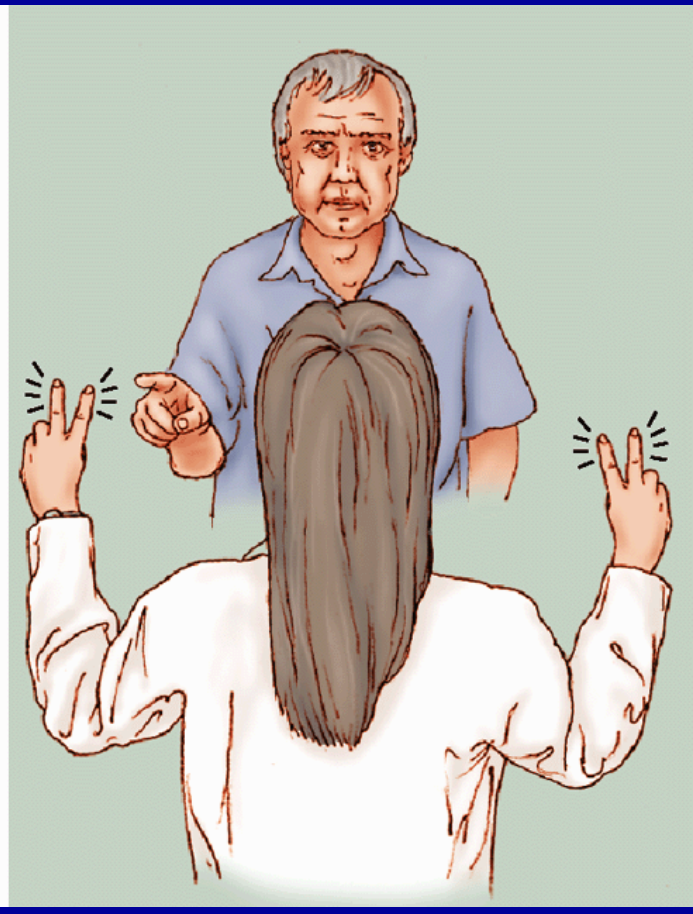
Extinction to double simultaneous stimulation



OK in left field for unilateral stimulation



OK in right field for unilateral stimulation



Neglect of left field for bilateral stimulation

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Anosagnosia - be unaware of or deny hemiparesis, hemianopia

Right-sided lesions; 5% of cases

Ramachandran Studies – Patients cannot use left arm after stroke

- Can you use your right hand?
 - *Yes.*
- Can you use your left hand?
 - *Yes.*
- Are both hands equally strong?
 - *Yes.*
- Can you point to my nose with your right hand?
 - *(she does)*
- Can you point to my nose with your left hand?
 - *(paralyzed hand does not move)*
- Are you pointing to my nose?
 - *Yes.*
- Can you clearly see it pointing?
 - *Yes, it is about two inches from your nose.*
- Can you clap?
 - *Of course I can clap (right hand alone moves).*
- Are you clapping?
 - *Yes I am clapping.*

rationalization - arthritis

$5 - screw in light bulb
$10 - tie shoelaces

tray of cocktail glasses filled with water - ask patient to hold tray - does so with right hand - tray tumbles

Syringe with ice cold water - irrigated left ear canal - patient's eyes started to move -

- **Do you feel ok?**
 - ***My ear is very cold, but other than that I am fine.***

Syringe with ice cold water - irrigated left ear canal - patient's eyes started to move -

- **Do you feel ok?**
 - ***My ear is very cold, but other than that I am fine.***
- **Can you use your hands?**
 - ***I can use my right arm, but not my left arm. I want to move it, but it doesn't move.***
- **Whose arm is this? (holding paralyzed arm)**
 - ***It is mine, of course.***
- **Can you use it?**
 - ***No, it is paralyzed.***
- **How long has your arm been paralyzed? Did it start just now or earlier?**
 - ***It's been paralyzed for several days now.***

90 minutes later - back to anosagnosia

Measures of neglect

a. writing in RVF

b. reading in RVF

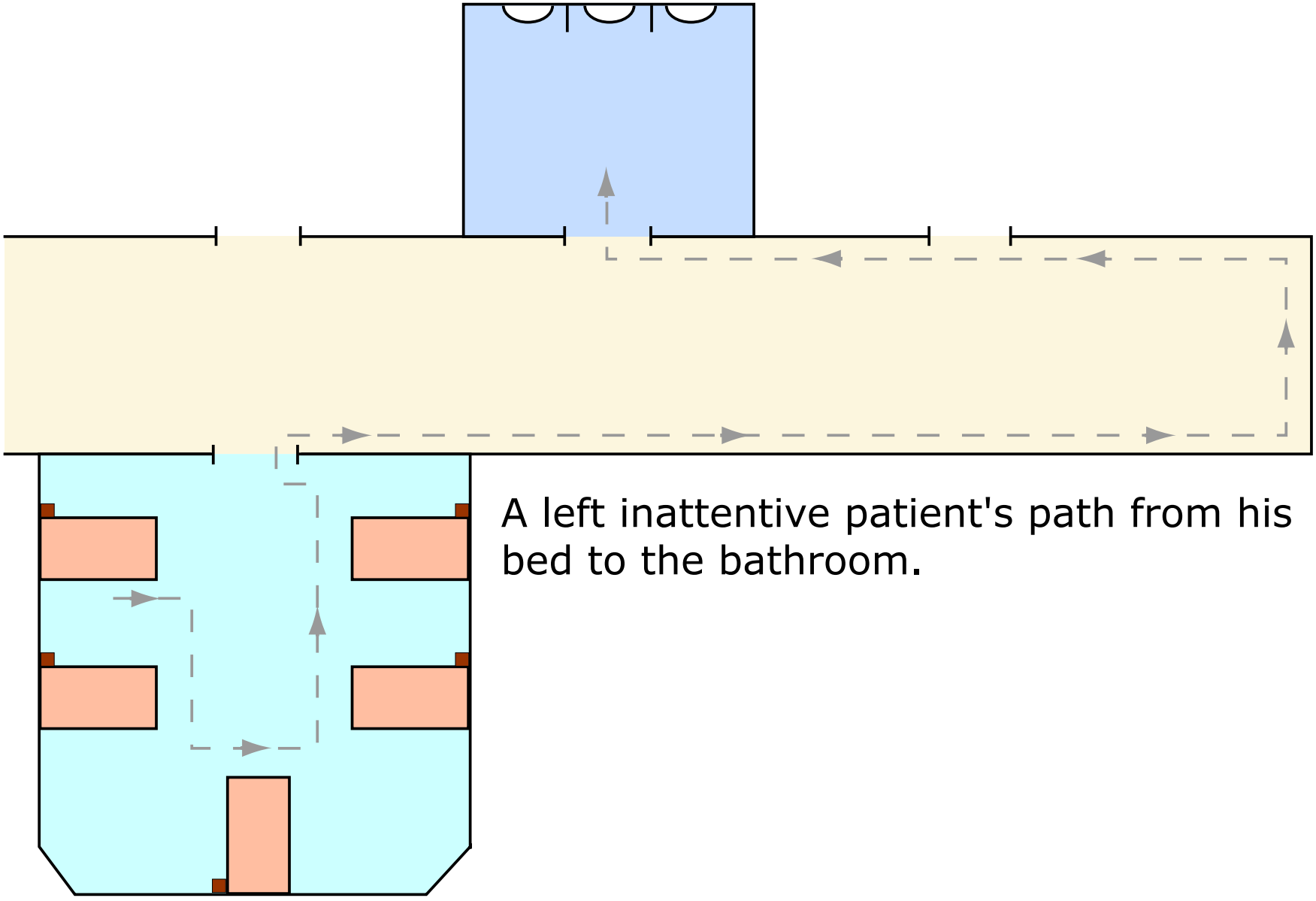
c. drawing clock, copying scenes

- drawing clock may be better if subject does not see drawing

d. cancellation or search tasks

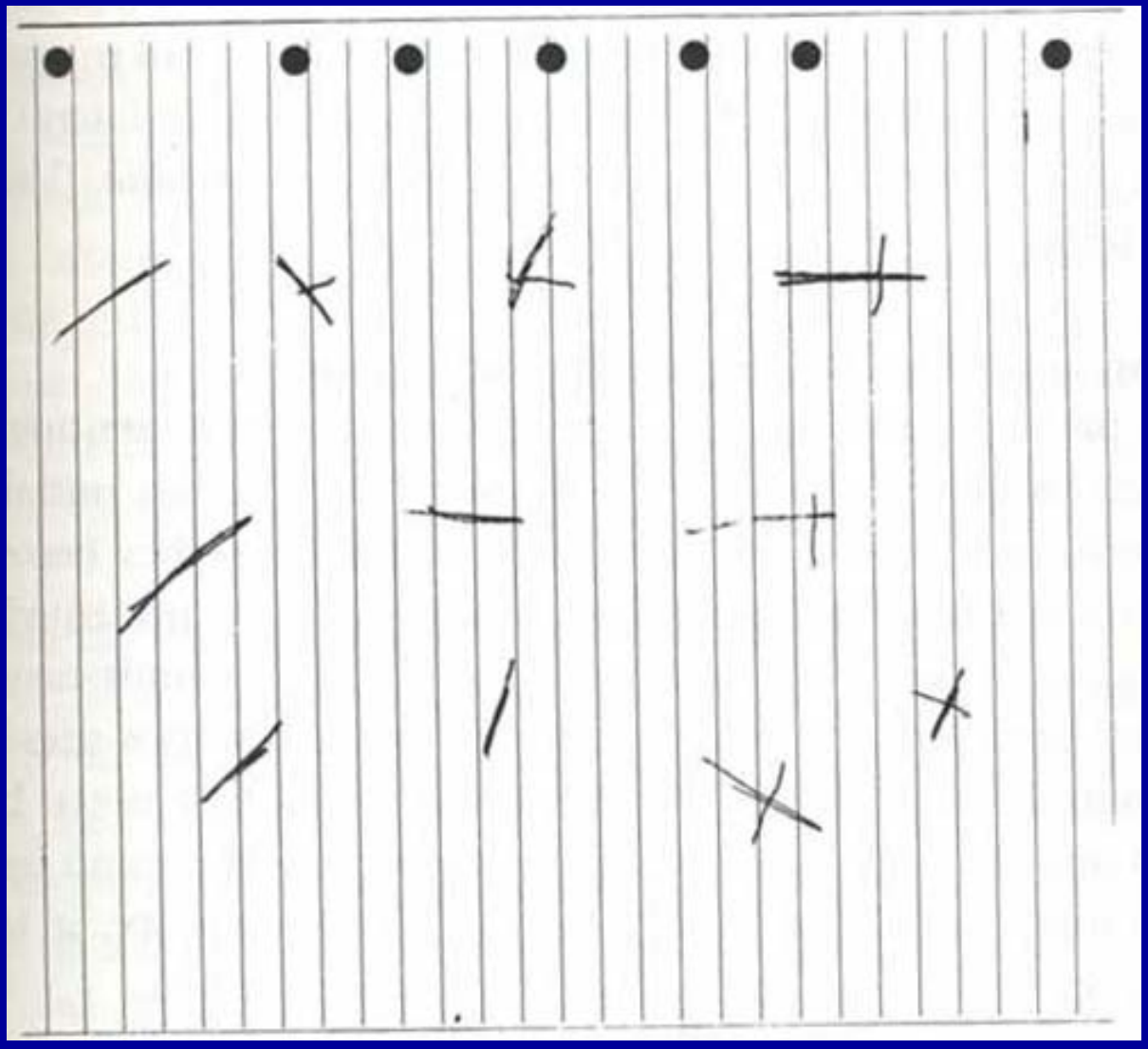
e. line bisection

- improved if subject is asked to read letter at neglected end - letter read ok if a single letter at left end
- left-end letter often missed if letters at each end
- greatest when letter at right end
- improved by varying starting position of hand



A left inattentive patient's path from his bed to the bathroom.

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Cancellation Task

mark all the A's

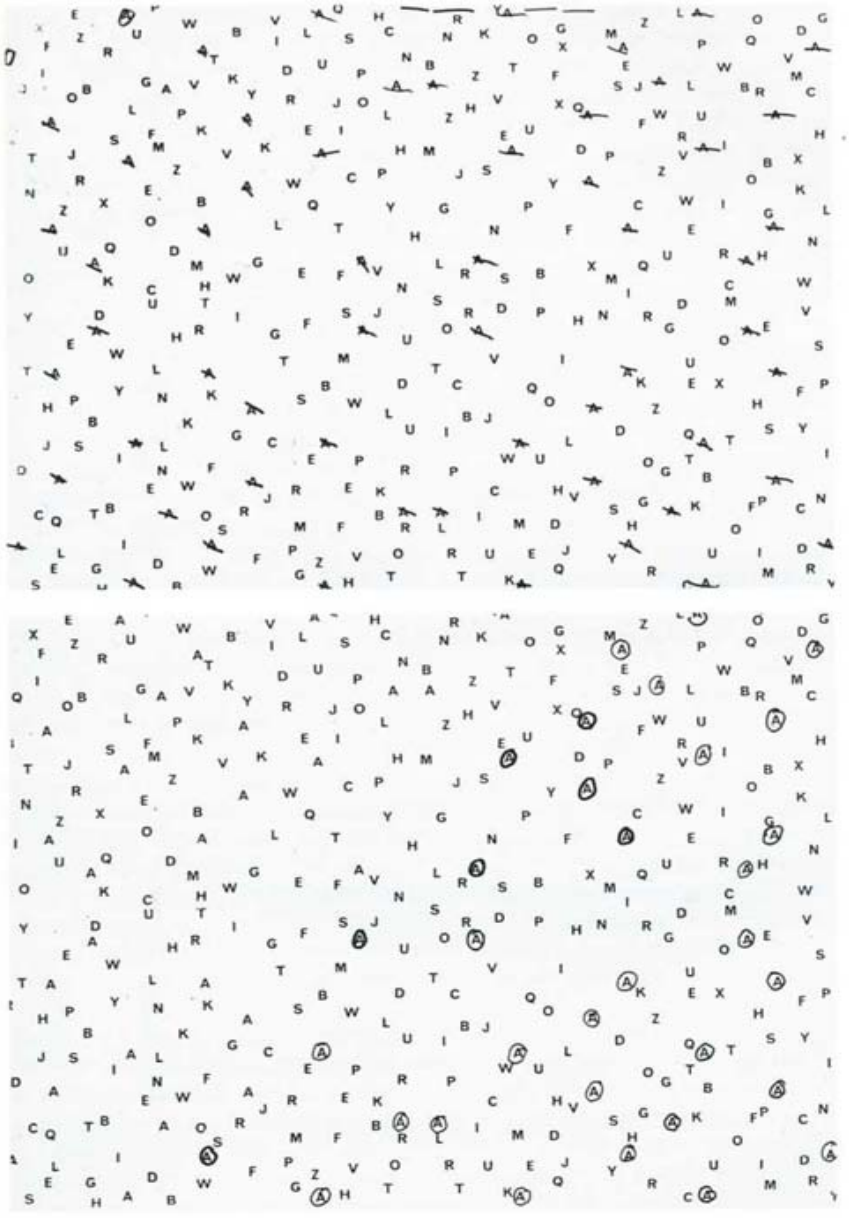


FIGURE 3. This figure shows the performance of two different patients on the random letter cancellation task. An 8 × 10 sheet of paper containing 15 As in each quadrant is placed directly in front of the patient, who is then asked to check or encircle all the As without moving the sheet of paper. *Top:* A 59-year-old right-handed woman suffered a left-sided stroke that left her with a dense right homonymous hemianopia. Despite the blind right hemifield, she does not miss any targets on the right. *Bottom:* A right-handed woman in her 70s had an infarct in the right frontal region. She developed a hemiparesis. Visual field testing did not reveal any hemianopia. However, she has marked neglect for targets on the left. These two patients demonstrate that there is no obligatory relationship between hemianopia and unilateral neglect.

Visual loss in RVF - does fine by moving eyes

Neglect of LVF no visual loss neglects LVF

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On his way out the town he// had to pass the prison, and as he looked in at the// windows, whom should he see but William himself peeping out of the bars, and looking very sad indeed.// "Good morning brother," said Tom, "have you any// message for the King of the Golden River?" William// ground his teeth with rage, and shook the bars// with all his strength; but Tom only laughed at him// and advising him to make himself comfortable till// he came back, shouldered his basket, shook the// bottle

Patient V.S.N. read only those words to the right of the parallel bars (Kartsounis & Warrington, 1989).

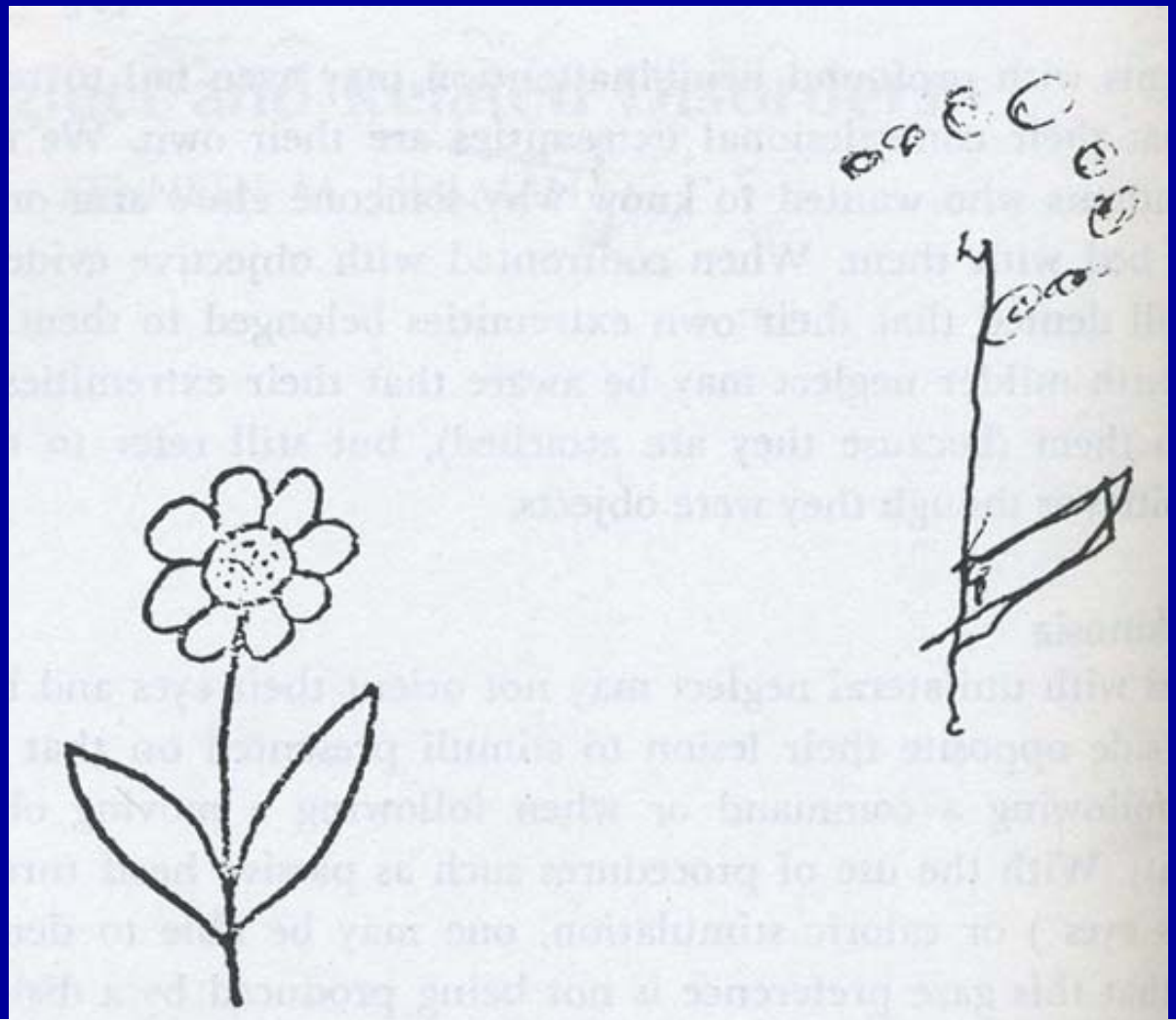


Fig. 10-1 An example of hemispatial neglect (visuospatial agnosia). Drawing on left performed by examiner. Drawing on right performed by patient.

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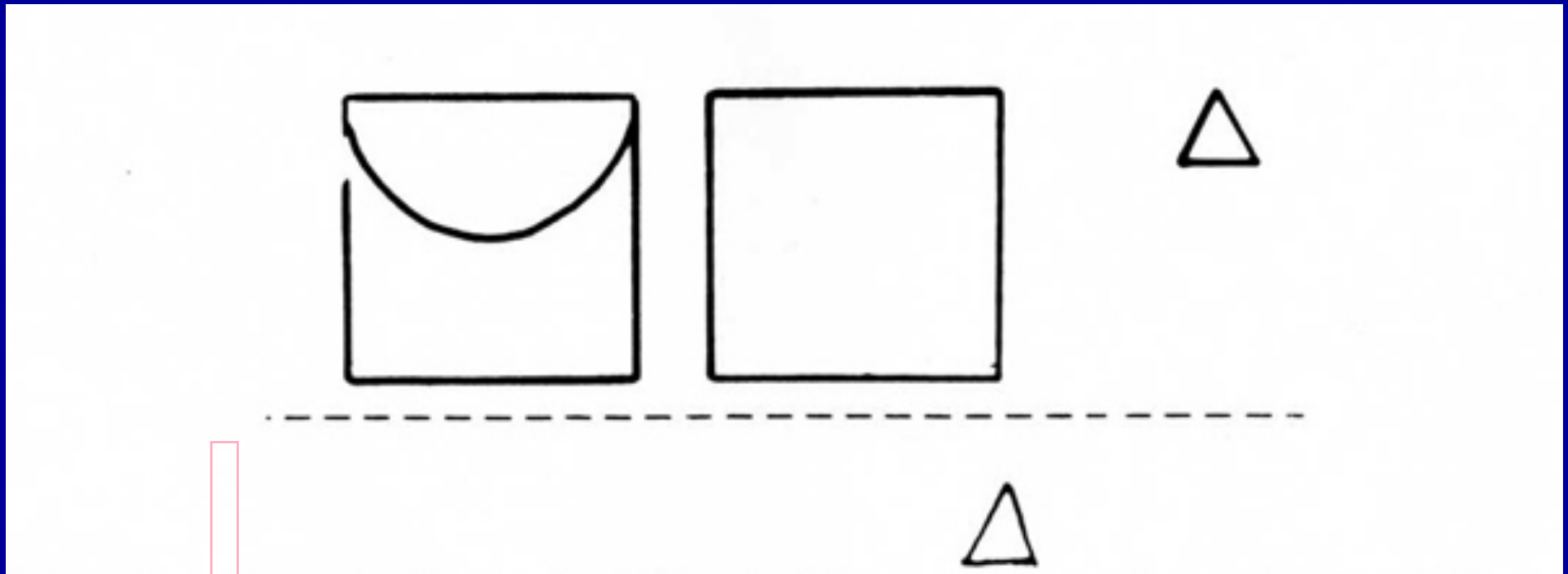


Figure 4.4 Example of omission of left-sided elements in a copying task. (Adapted from Kartsounis & Warrington, 1989.)

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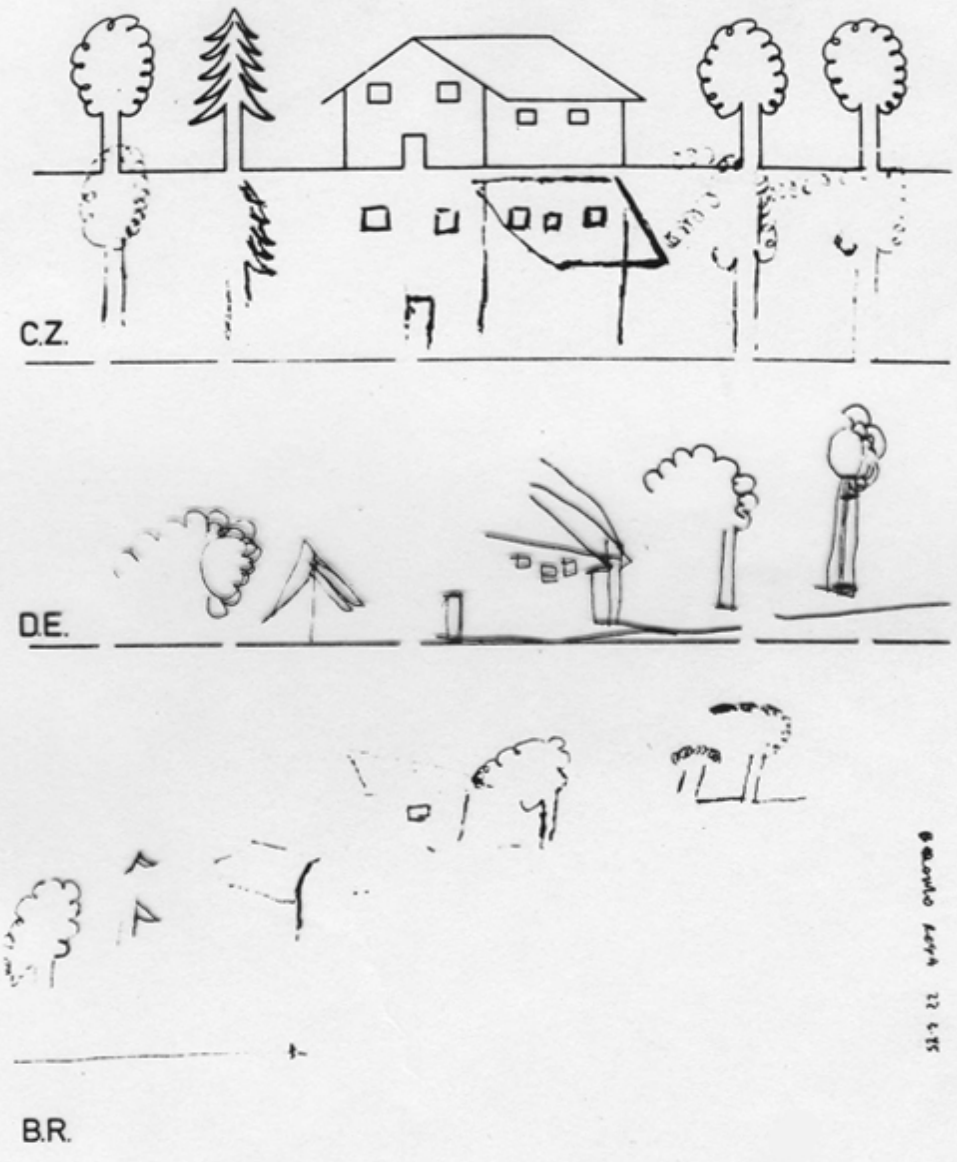


FIG. 3. Examples of copies made by right brain-damaged patients of the composite figure shown on the top. In each case patients left unfinished half of one or more elements, reproducing, however, parts of the model placed even more laterally on the neglected side of space.

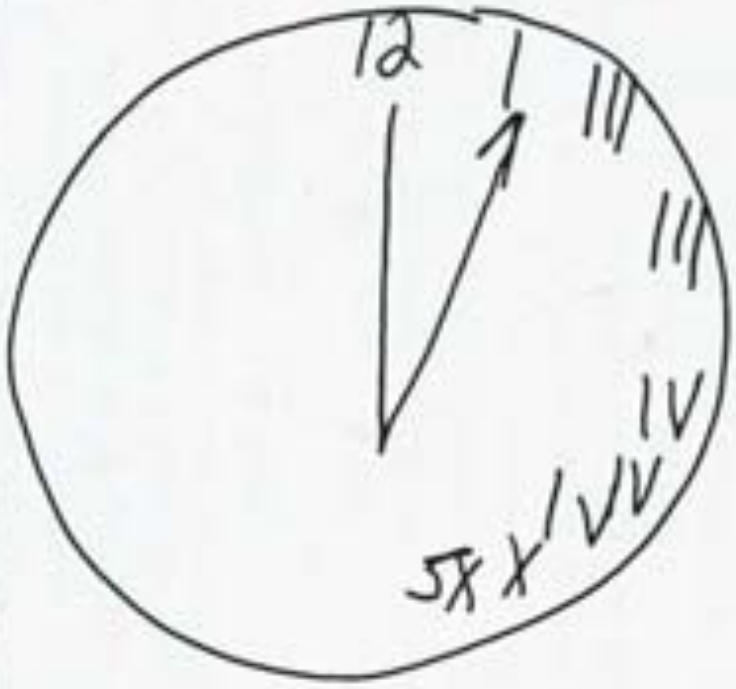
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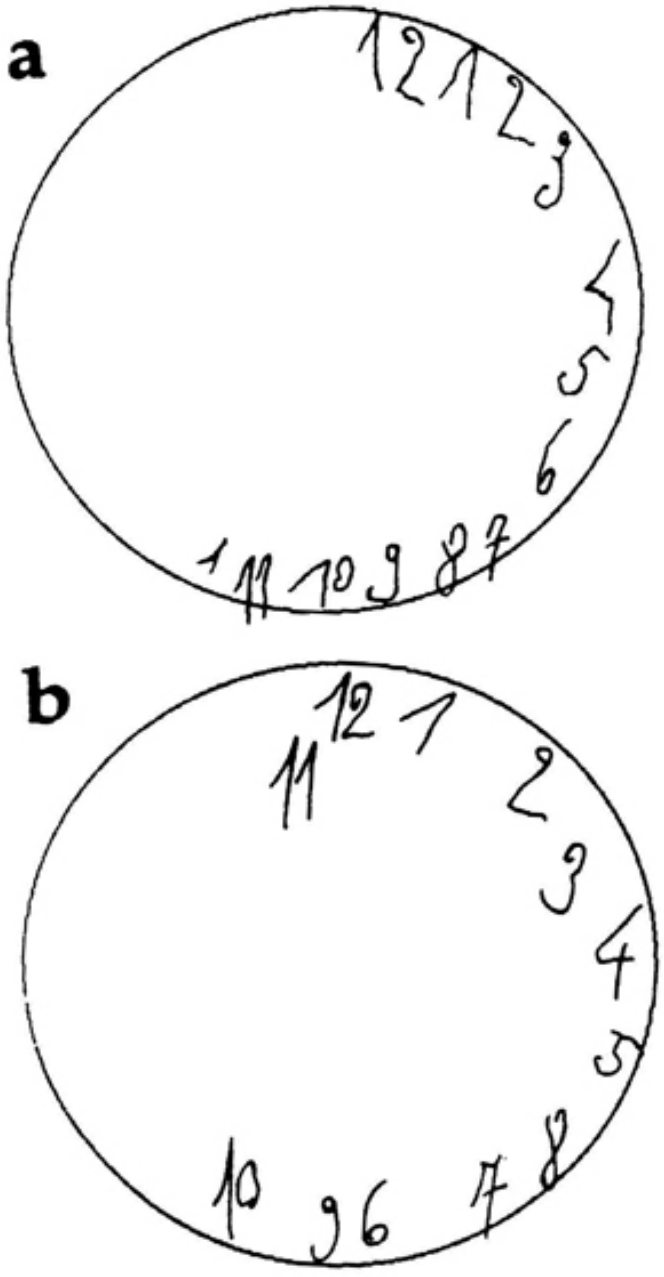
Date

HISTORY SHEET

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(a) Example of C.B.'s clock-drawing in condition 1. Note that hours were compressed on the t side of the dial as if there was no left space. (b) Example of clock-drawing in condition 2; numbers raw inside the circles were given to the patient one at a time in the following order: 12, 6, 11, 4, 9, 1, 3, 7, 10, 5, 8, 2.

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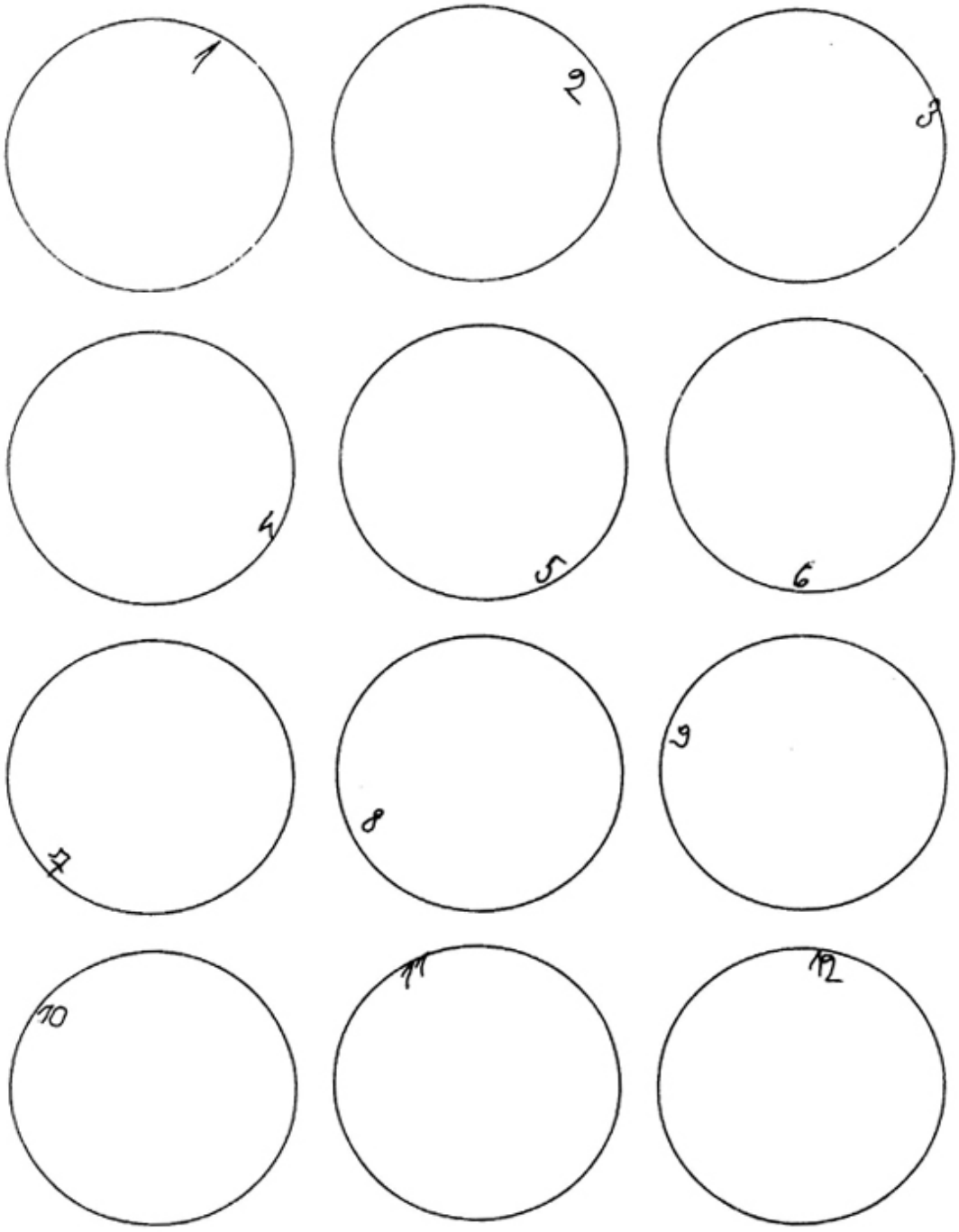
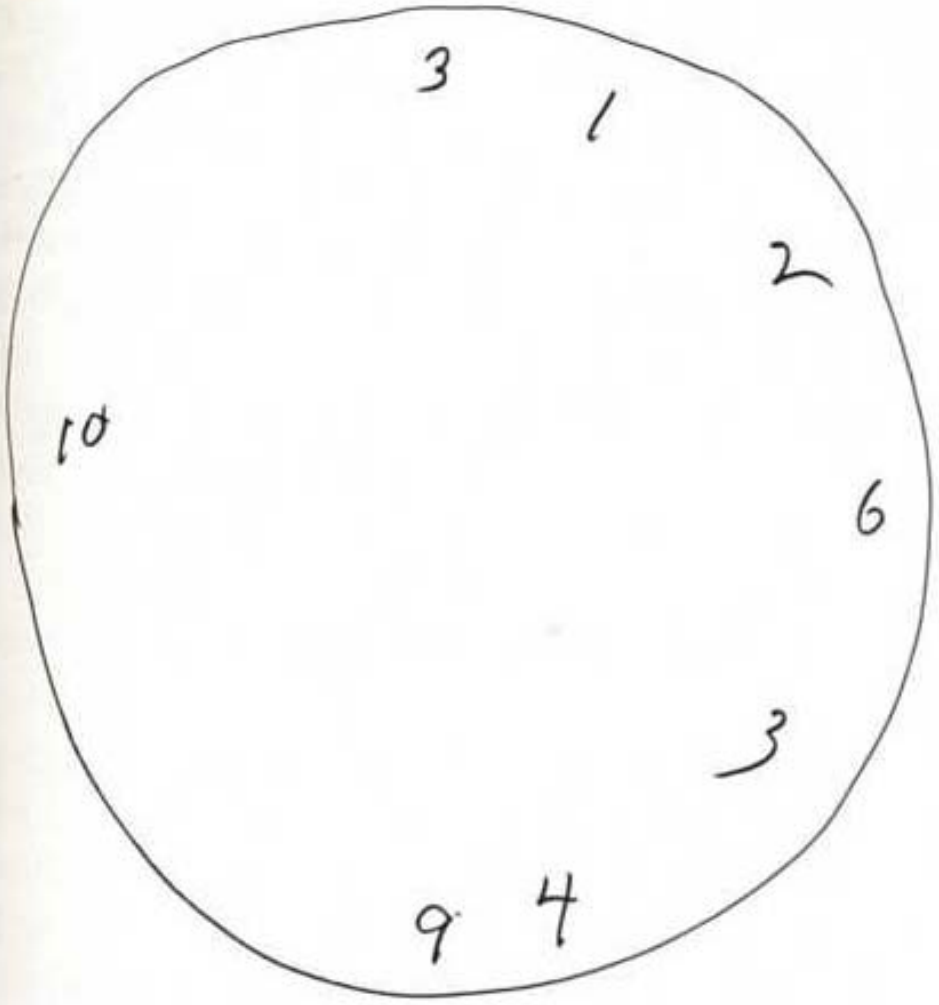
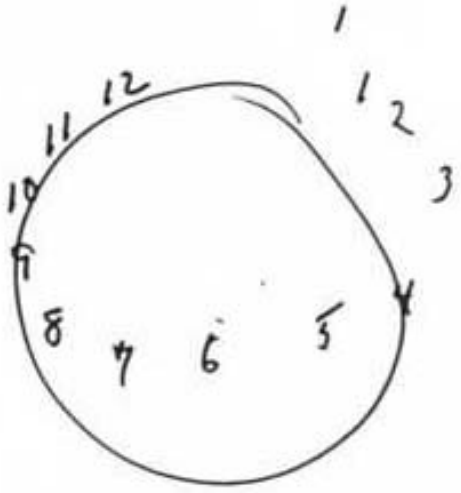


Fig. 2. Examples of C.B.'s performance on condition 3. The patient received one blank dial at a time, and drew inside it a number (hour) given by the experimenter following a sequence identical to that reported in Fig. 1(b).

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EYES OPEN



EYES CLOSED

FIGURE 4. A 60-year-old right-handed man had a right frontoparietal stroke that left him with left unilateral neglect and severe aphasia. The clock on the left was drawn with the eyes open and shows neglect of the left. The clock on the right was drawn with the eyes closed and shows a marked reduction of the neglect.

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NEGLECT OCCURS ACROSS MODALITIES

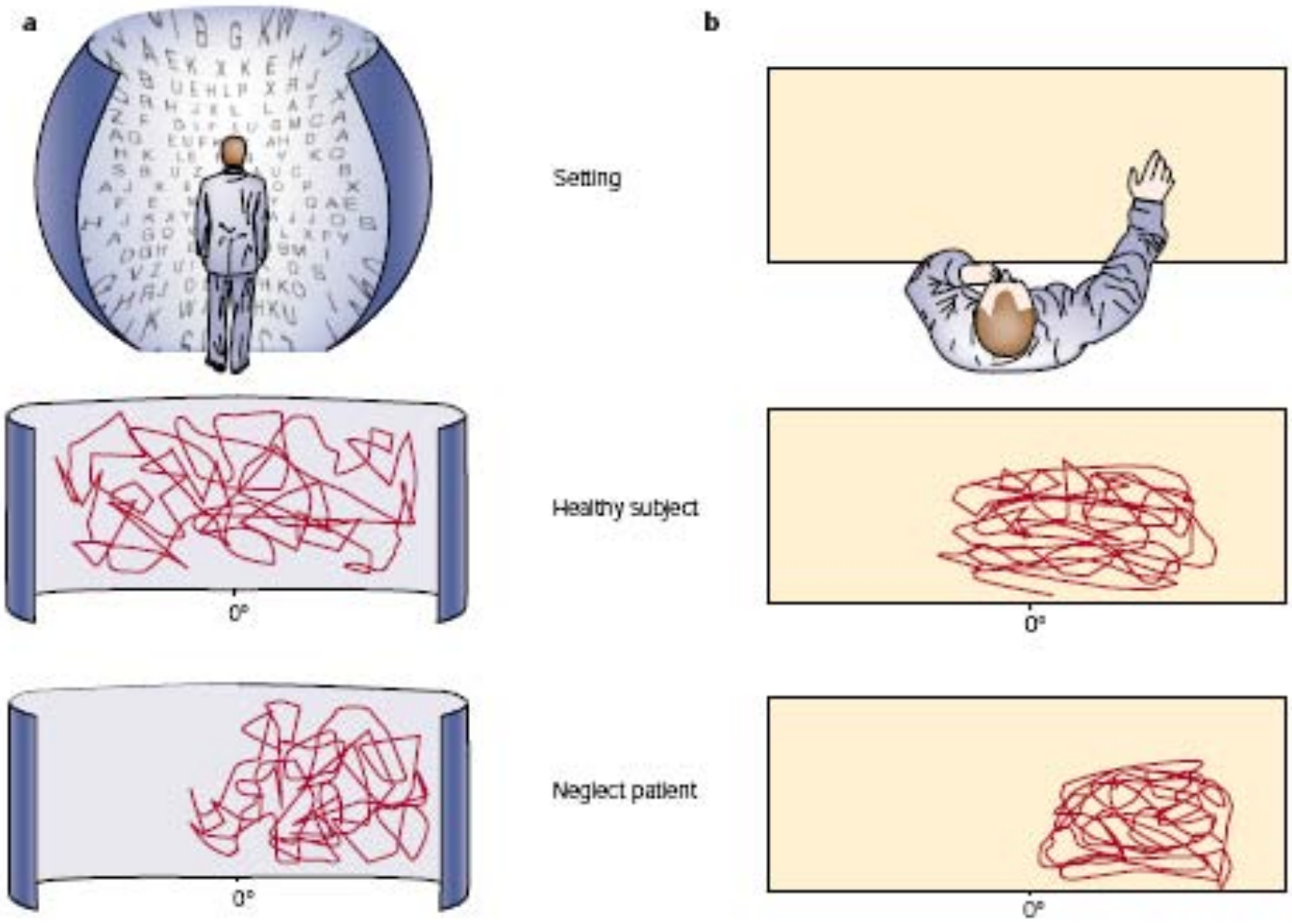


Figure 2 | **Scan paths during visual and tactile exploration of the surroundings.** The task consists of searching for a target **a** | in a visual scene with combined eye–head movements or **b** | on a table by tactile searching with the hand while the eyes are closed. Similar to a healthy subject, a neglect patient explores space with eye or hand movements that are symmetrically distributed around a preferred orientation in space. However, in the neglect patient, this centre of exploration is shifted to the right[4,5]. The average horizontal position of eye and hand movements lies right of the body's mid-sagittal plane. Information on the contralesional side is neglected.

visual exploration **tactual exploration**

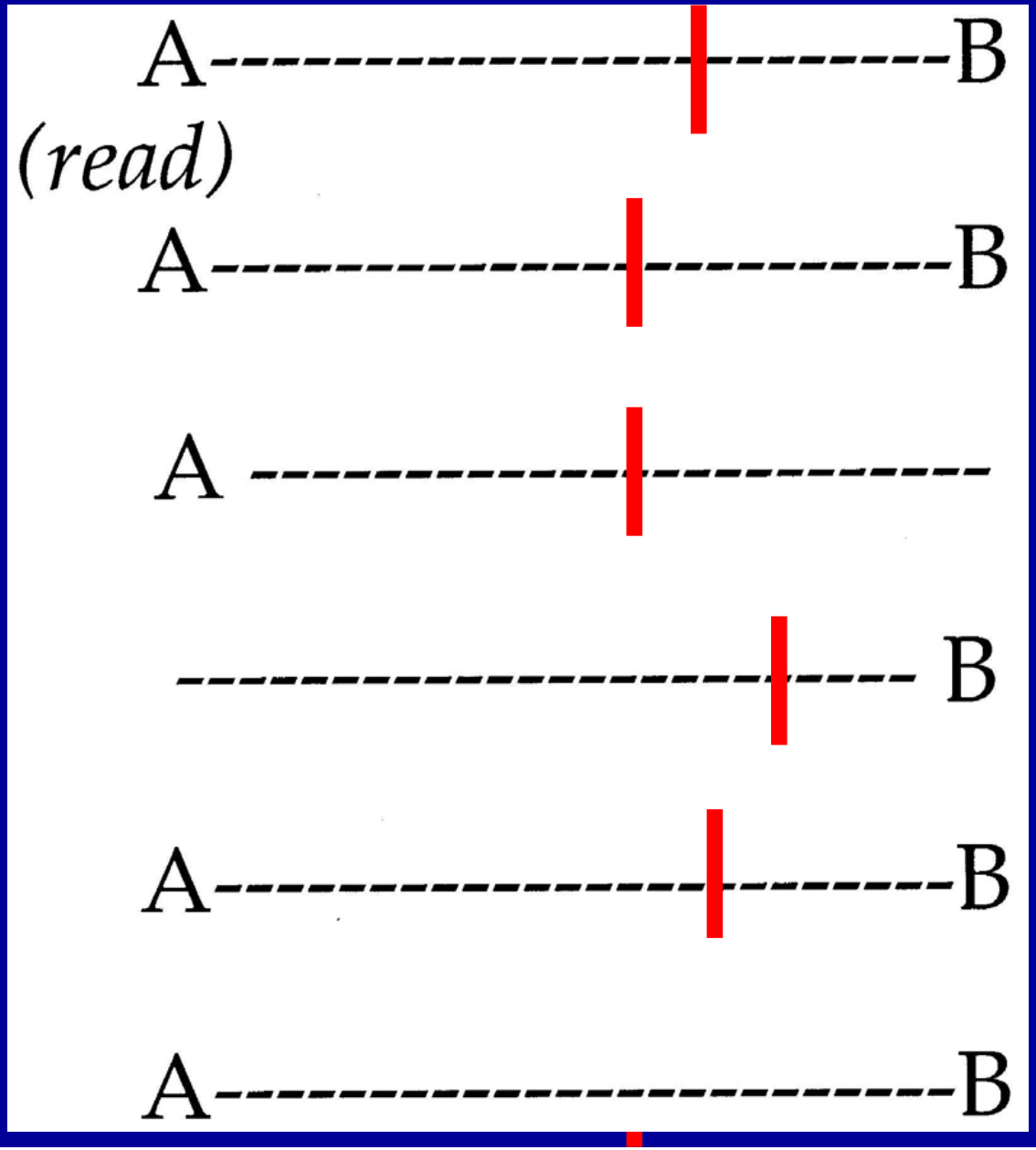
Karnath,

Nature, 2001

http://www.nature.com/nature/journal/v411/n6840/abs/411950a0.html

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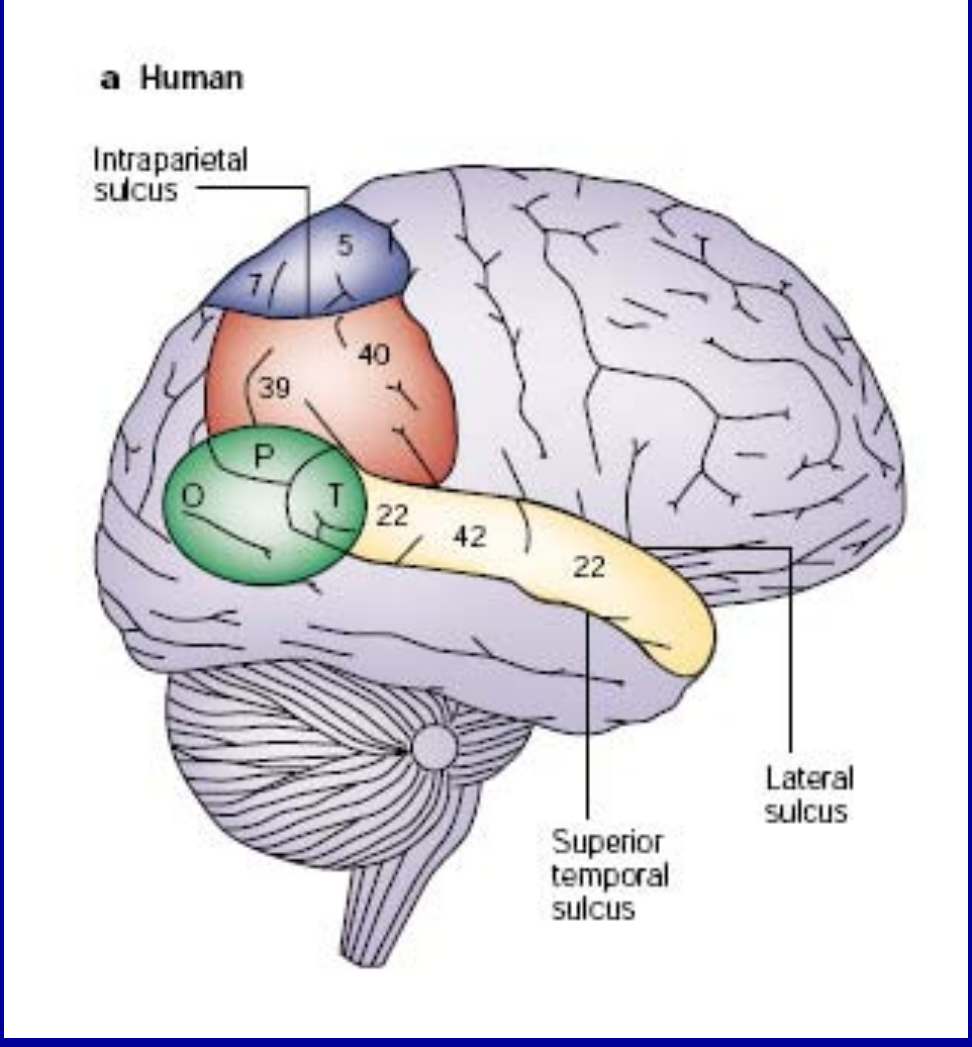
Line Cancellation
Mark the Middle of the Line



WHERE IS THE LESION?

- old idea – parietal cortex – where deficit
- new idea – temporal cortex that leads to ipsilateral hypofunction in intact parietal cortex, contralateral hyperfunction in intact parietal cortex
- parietal cortices become balanced with recovery

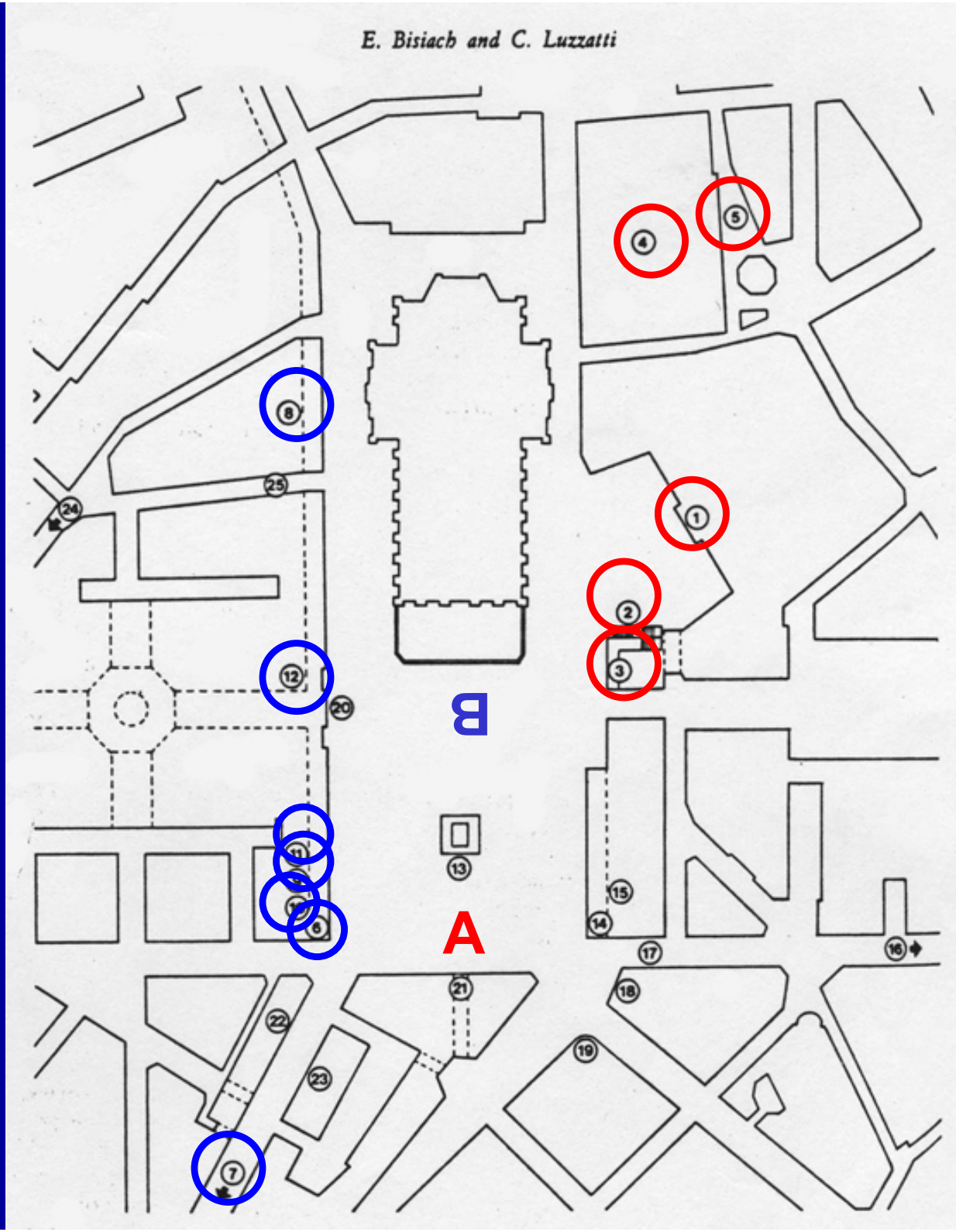
Superior temporal and parietal cortex



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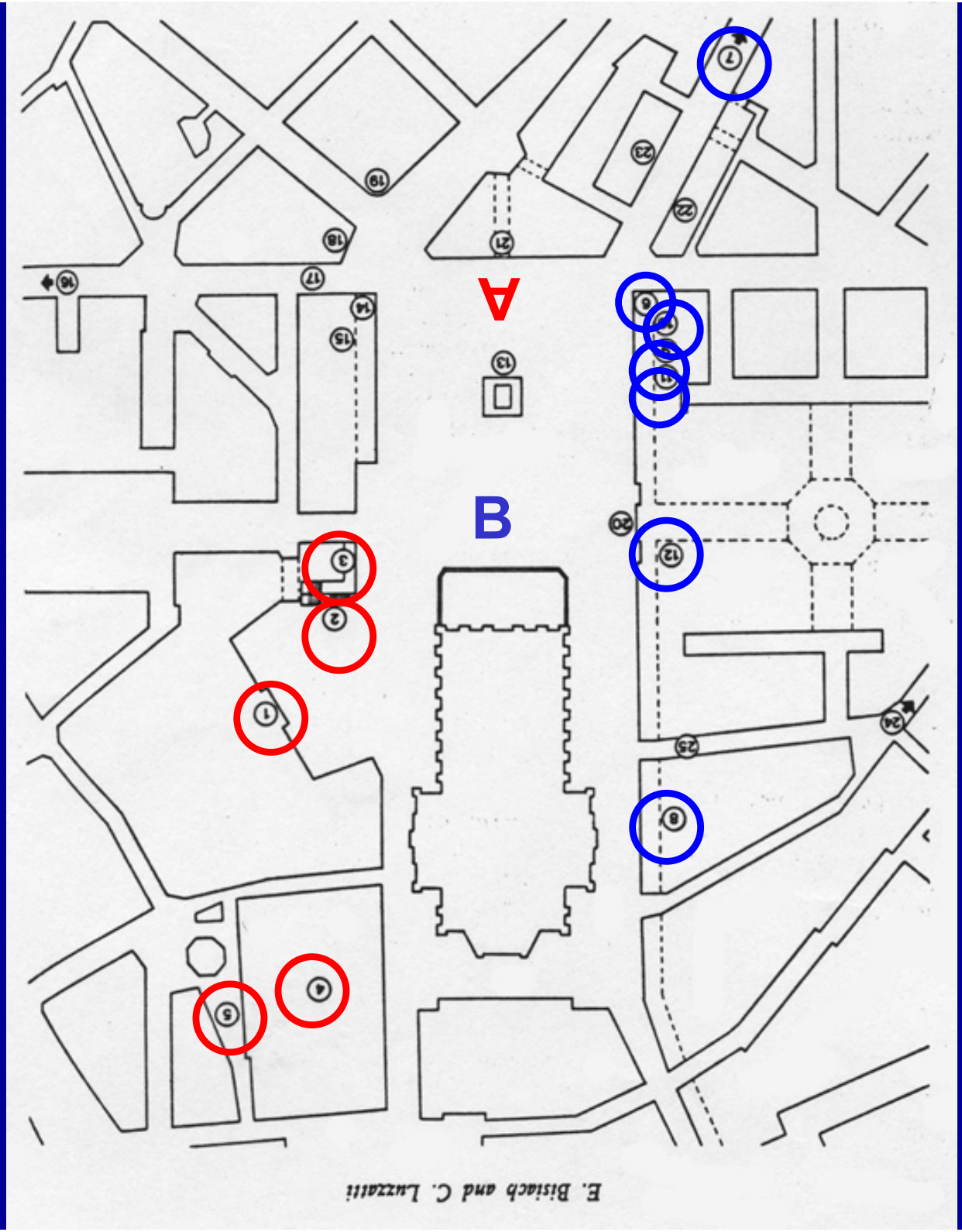
Representational Theory

- Bisiach & Luzzati (1978) - Milanese patients asked to describe the Piazza del Duomo looking at or looking from cathedral
- Bisiach, Luzzati, & Perani (1979)
 - random, cloud-like stimuli seen only through a slot
 - two sequentially seen stimuli - same or different?
 - patients with left-sided neglect made more errors when stimuli differed on left side



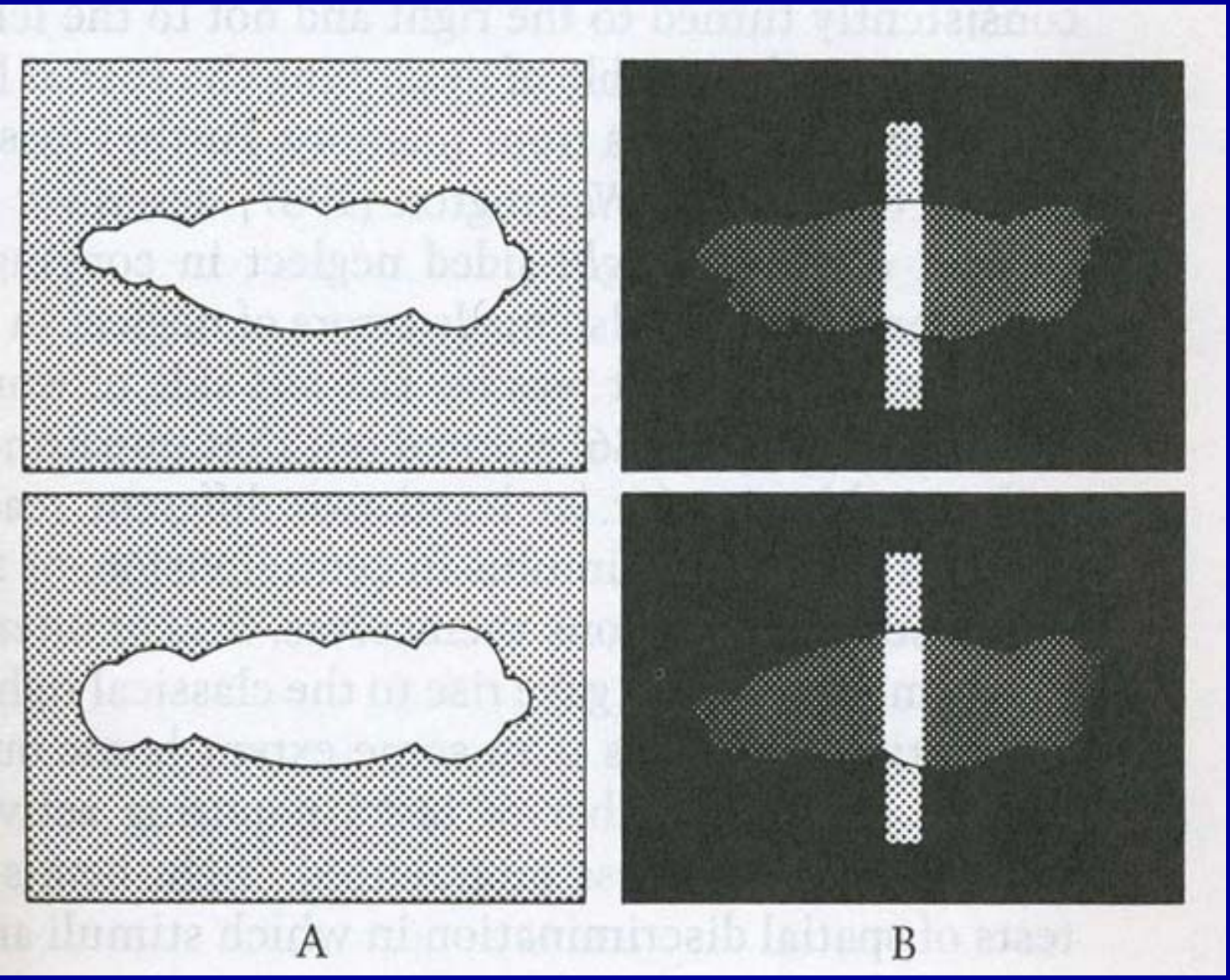
from imagined perspective A, only reports places circled in red

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from imagined perspective B, only reports places circled in blue

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— two sequentially seen stimuli - same or different?

– patients with left-sided neglect made more errors when stimuli differed on left side

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Posner's Disengagment Deficit of Cortical Visuospatial Neglect

Engage Attention

Disengage Attention

Move Attention

Tasks to measure allocation of "spotlight" of attention

Simple Reaction Time (RT) to onset of light in a box

Cue Location

Central - arrow points to right or left

Endogenous/voluntary

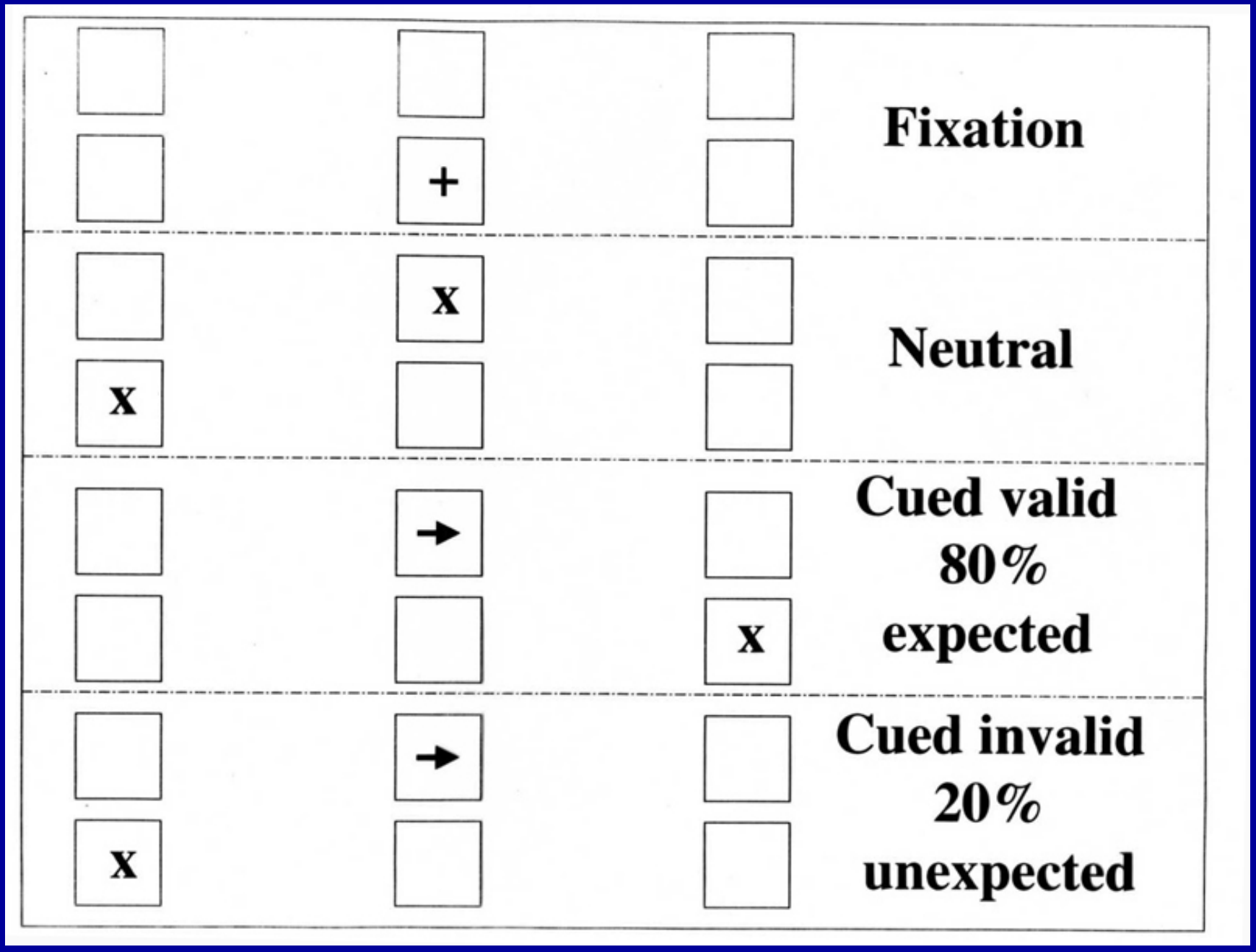
Cue Type

Valid - 80%

Invalid - 20%

Neutral - (central cross)

Subjects benefit from valid cue, are slowed by invalid cue



Task - press button when X appears on either side

Normal Subjects

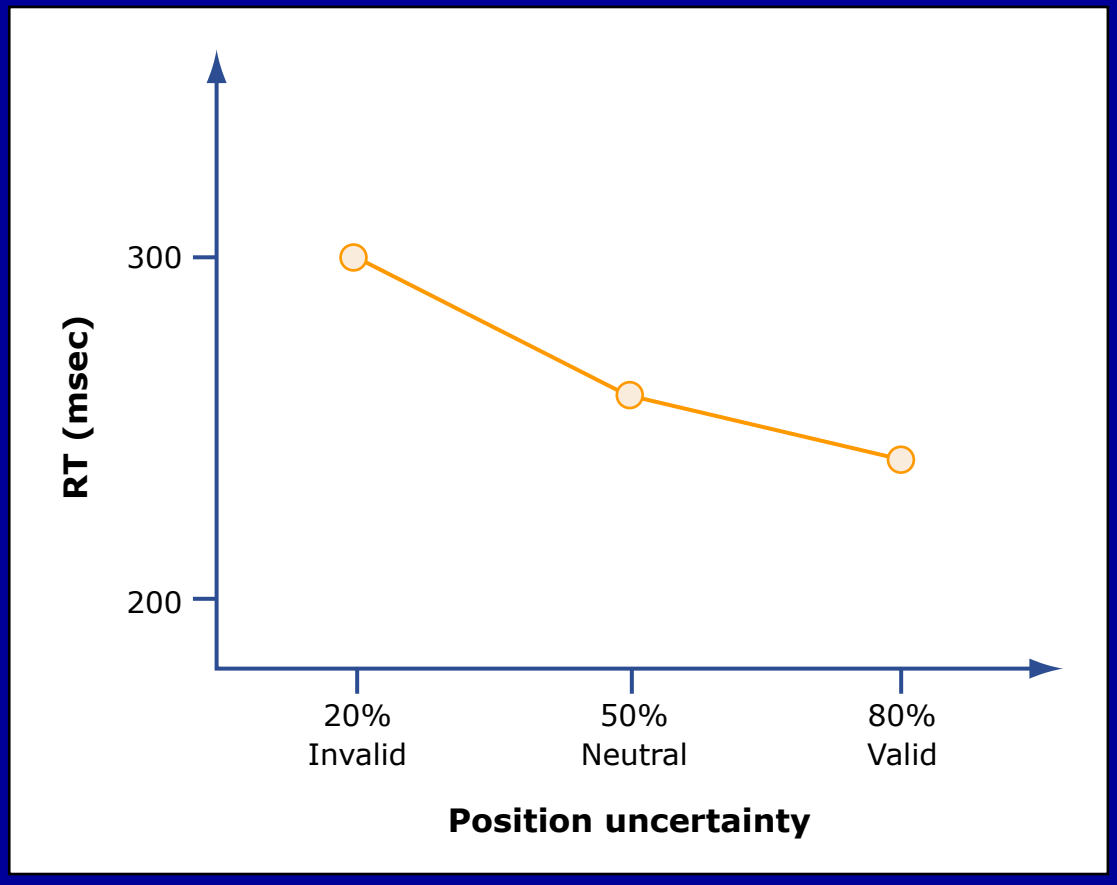


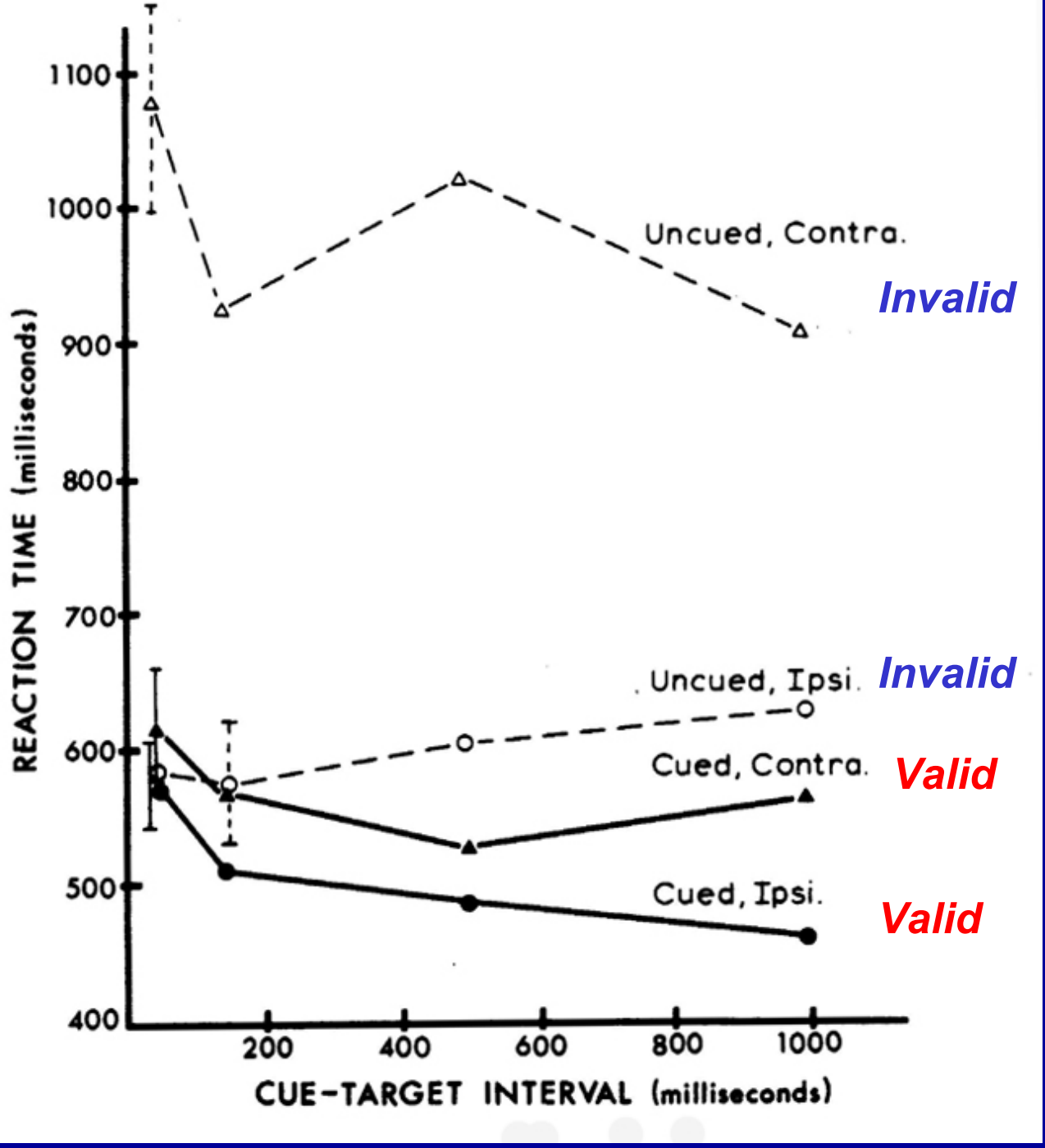
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Posner et al., 1980

Patient Performance

Parietal Stroke

- major deficit in responding to invalid cues on contralesional side
- mild deficit to cued contralateral stimuli indicates that subjects can engage contralateral stimuli
- similar RT patterns to cued stimuli indicates that patients could move attention
- problem is one of disengagment from invalid, ipsilateral location

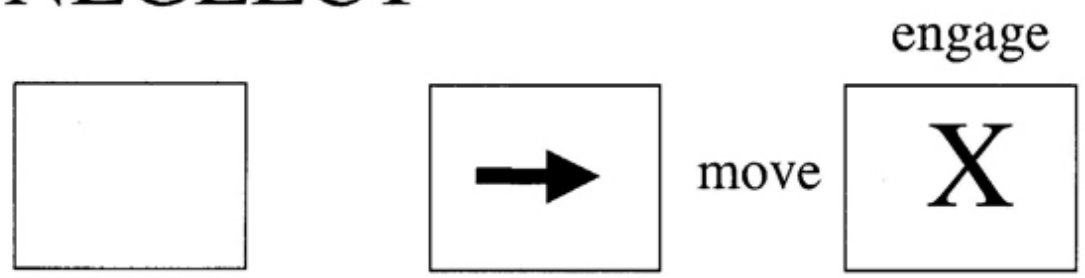


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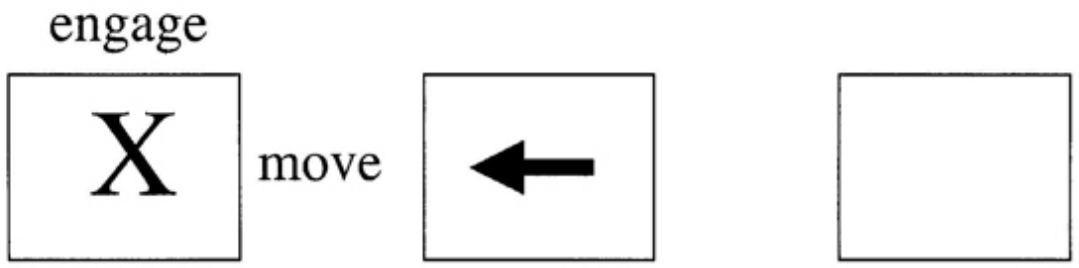
Neglected LVF

Intact RVF

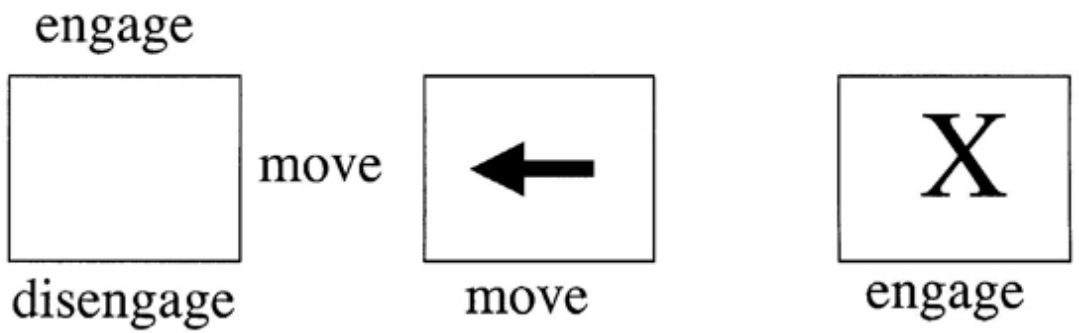
NEGLECT



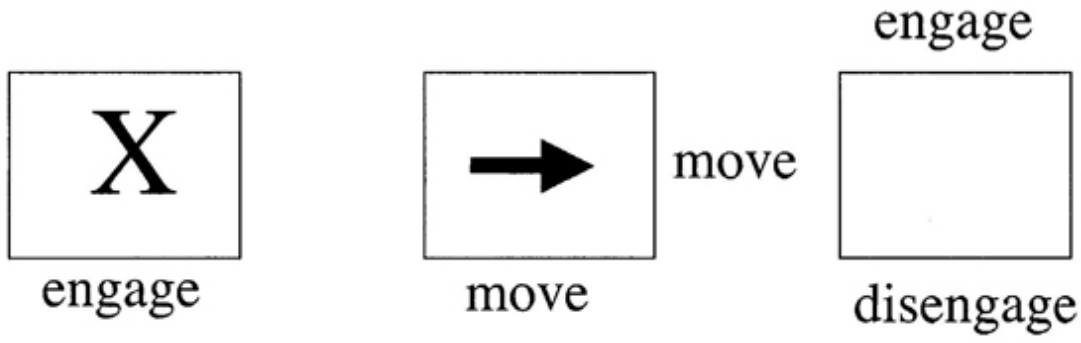
good valid



good valid

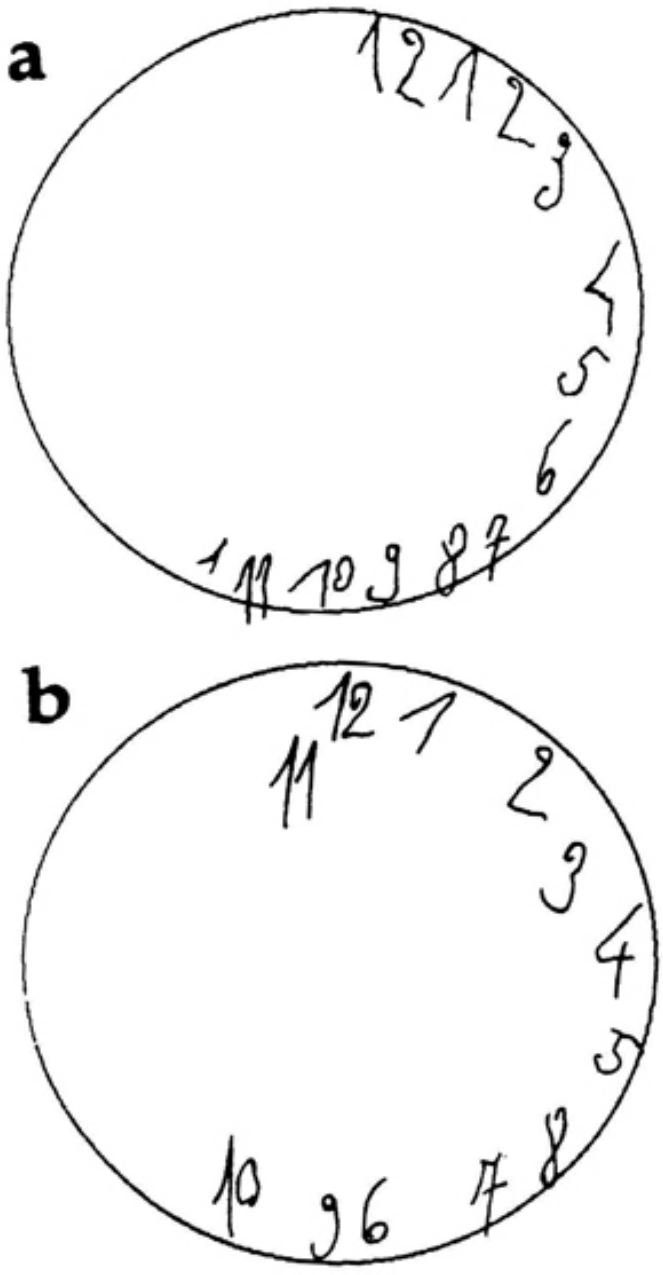


good invalid



poor invalid

Failure to disengage attention in intact field



(a) Example of C.B.'s clock-drawing in condition 1. Note that hours were compressed on the t side of the dial as if there was no left space. (b) Example of clock-drawing in condition 2; numbers raw inside the circles were given to the patient one at a time in the following order: 12, 6, 11, 4, 9, 1, 3, 7, 10, 5, 8, 2.

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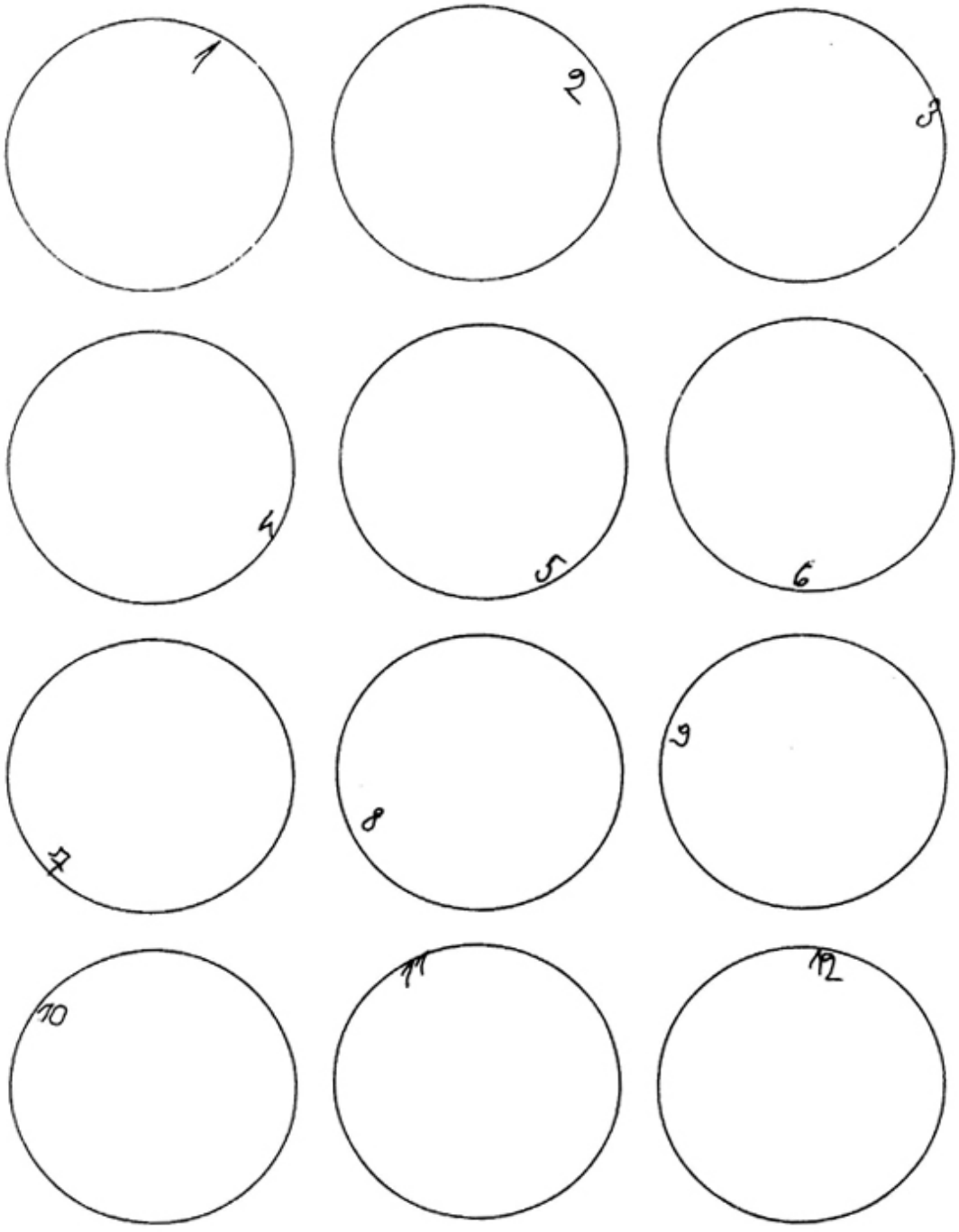
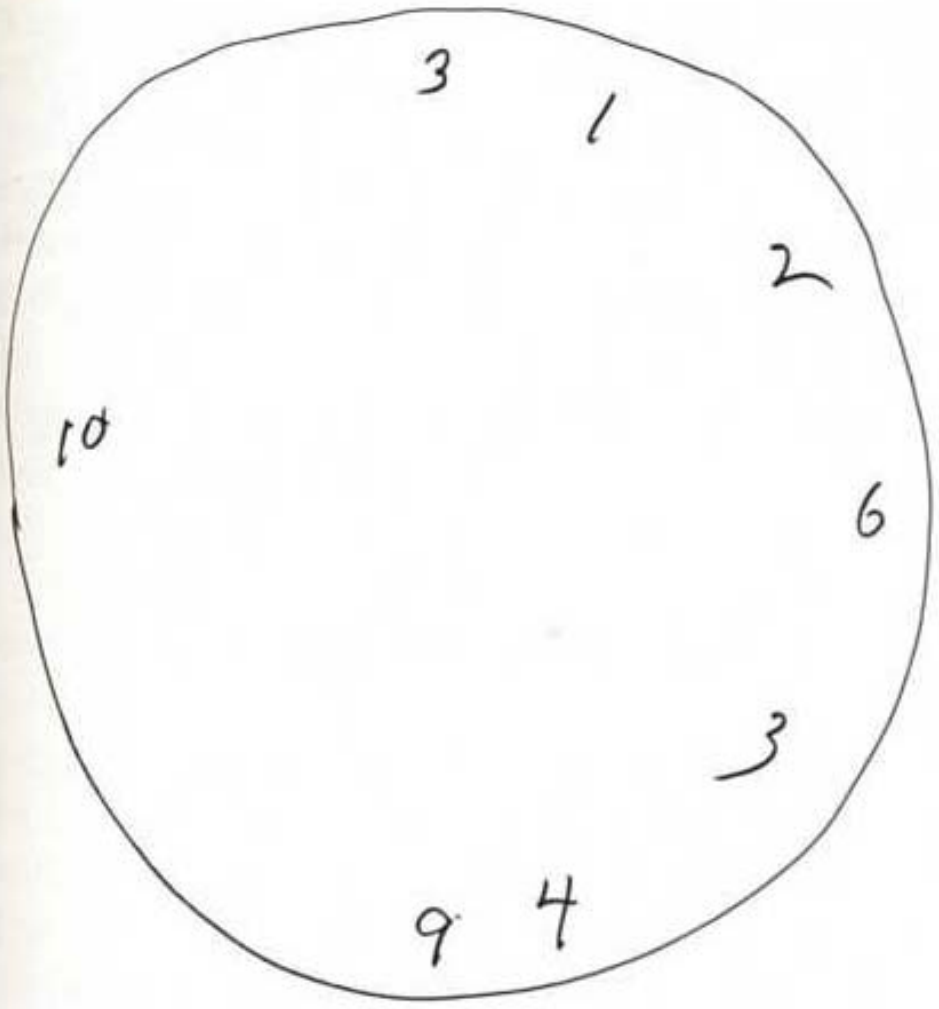
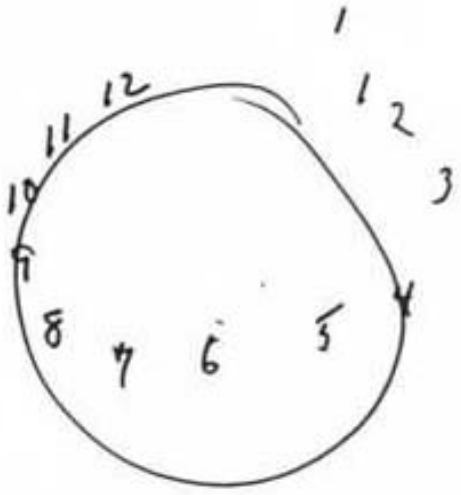


Fig. 2. Examples of C.B.'s performance on condition 3. The patient received one blank dial at a time, and drew inside it a number (hour) given by the experimenter following a sequence identical to that reported in Fig. 1(b).

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EYES OPEN



EYES CLOSED

FIGURE 4. A 60-year-old right-handed man had a right frontoparietal stroke that left him with left unilateral neglect and severe aphasia. The clock on the left was drawn with the eyes open and shows neglect of the left. The clock on the right was drawn with the eyes closed and shows a marked reduction of the neglect.

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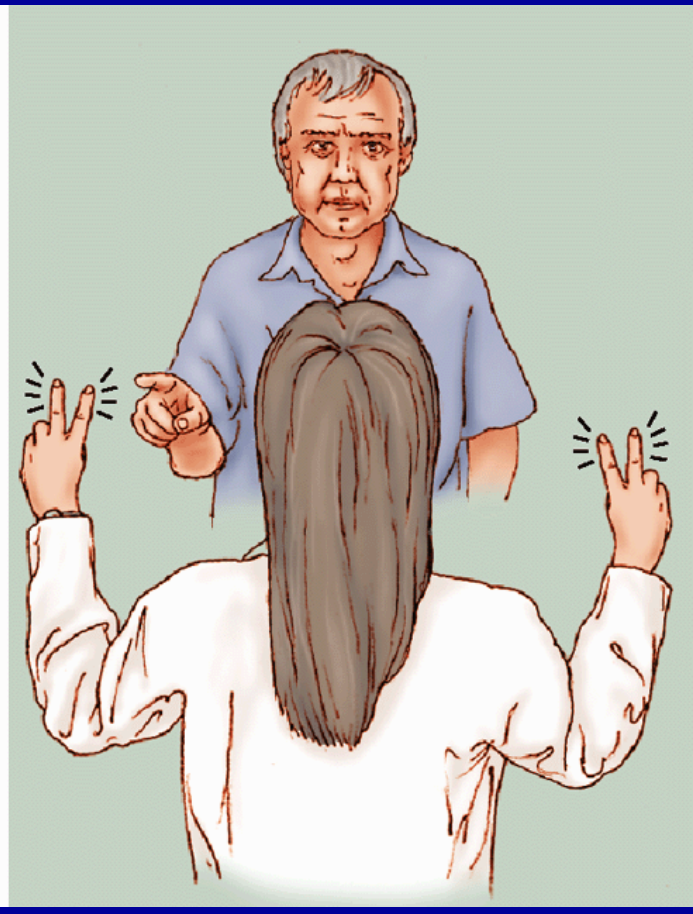
Extinction to double simultaneous stimulation



OK in left field for unilateral stimulation



OK in right field for unilateral stimulation



Neglect of left field for bilateral stimulation

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What happens if a display is rotated 180-degrees?

(so that visual fields are now reversed?)

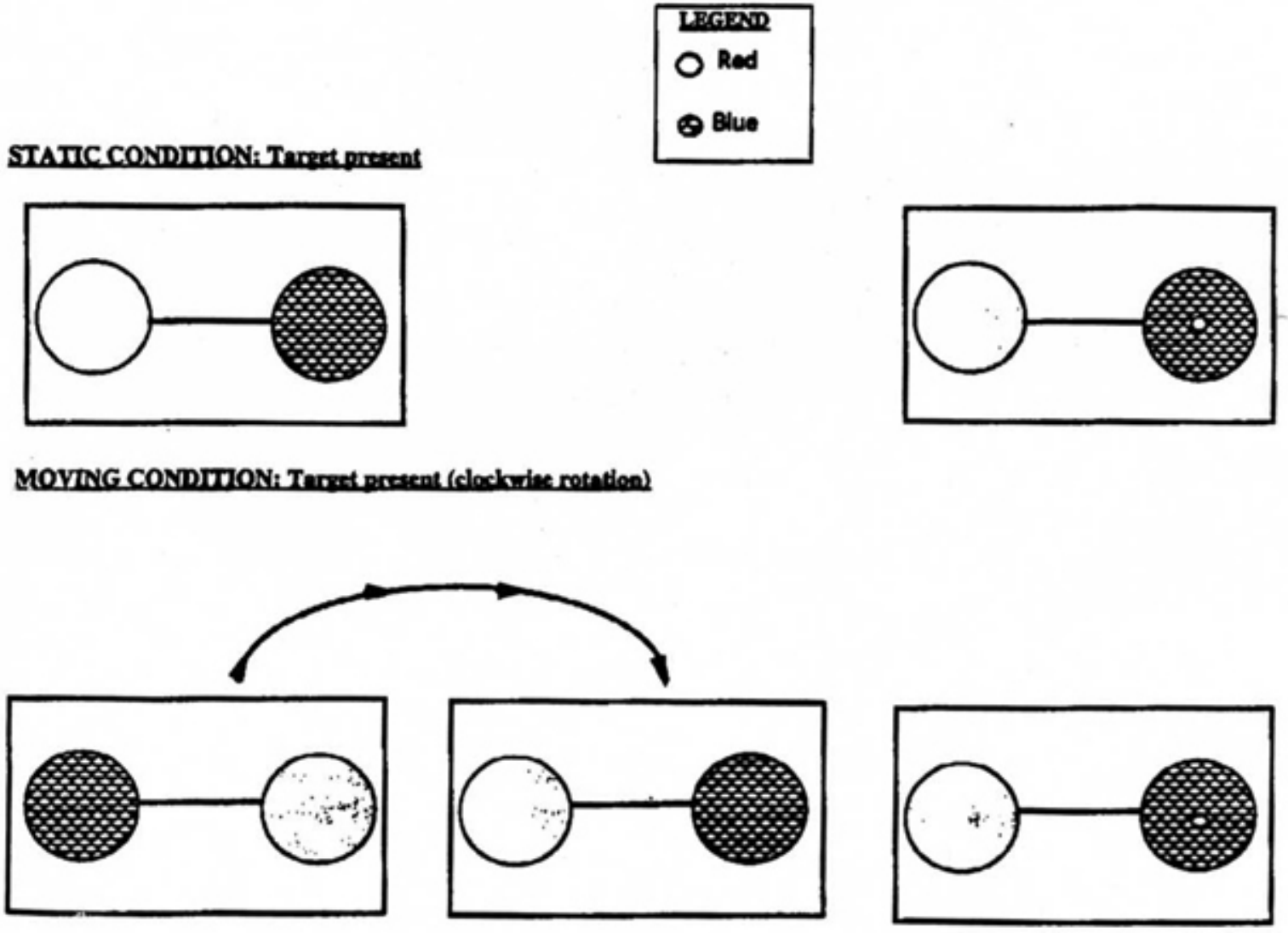


Figure 14.1 Diagram depicting the barbell in the static and the moving condition.

Object-based Neglect

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Static - slower responses to targets in LVF than RVF

Moving - slower responses to targets in RVF than LVF
neglect has moved

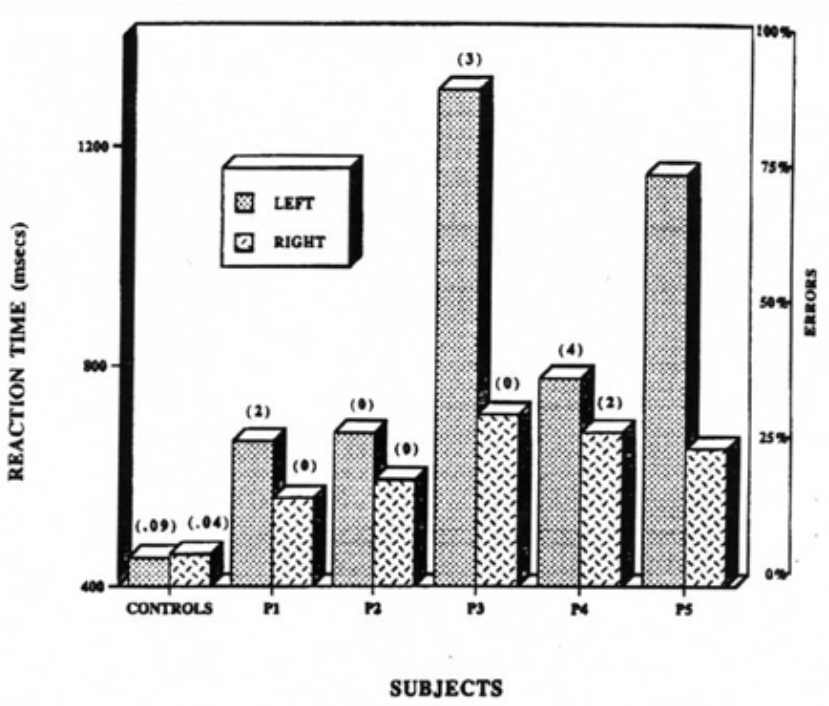


Figure 14.3 Mean reaction time to detect the targets in the static condition as a function of side for control subjects and for patients. Error proportion for all except P5 are shown in brackets. The Y-axis of percentage errors on right side applies only to P5.

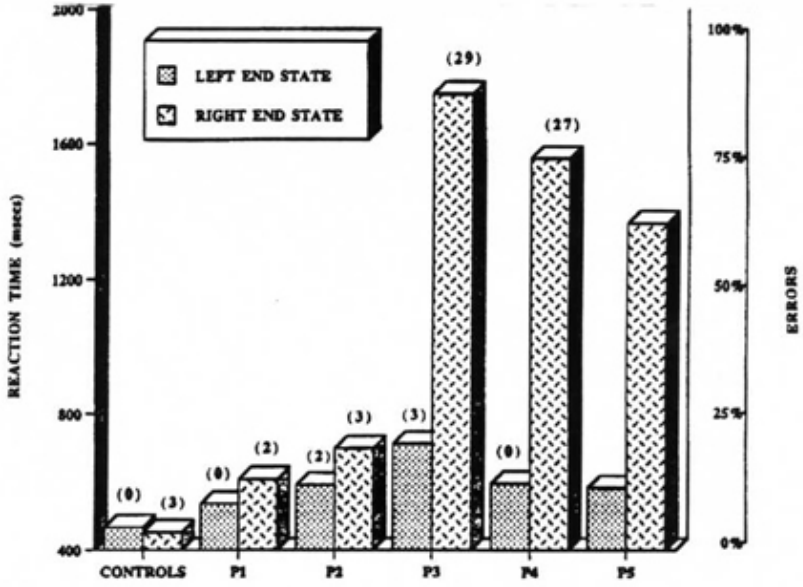
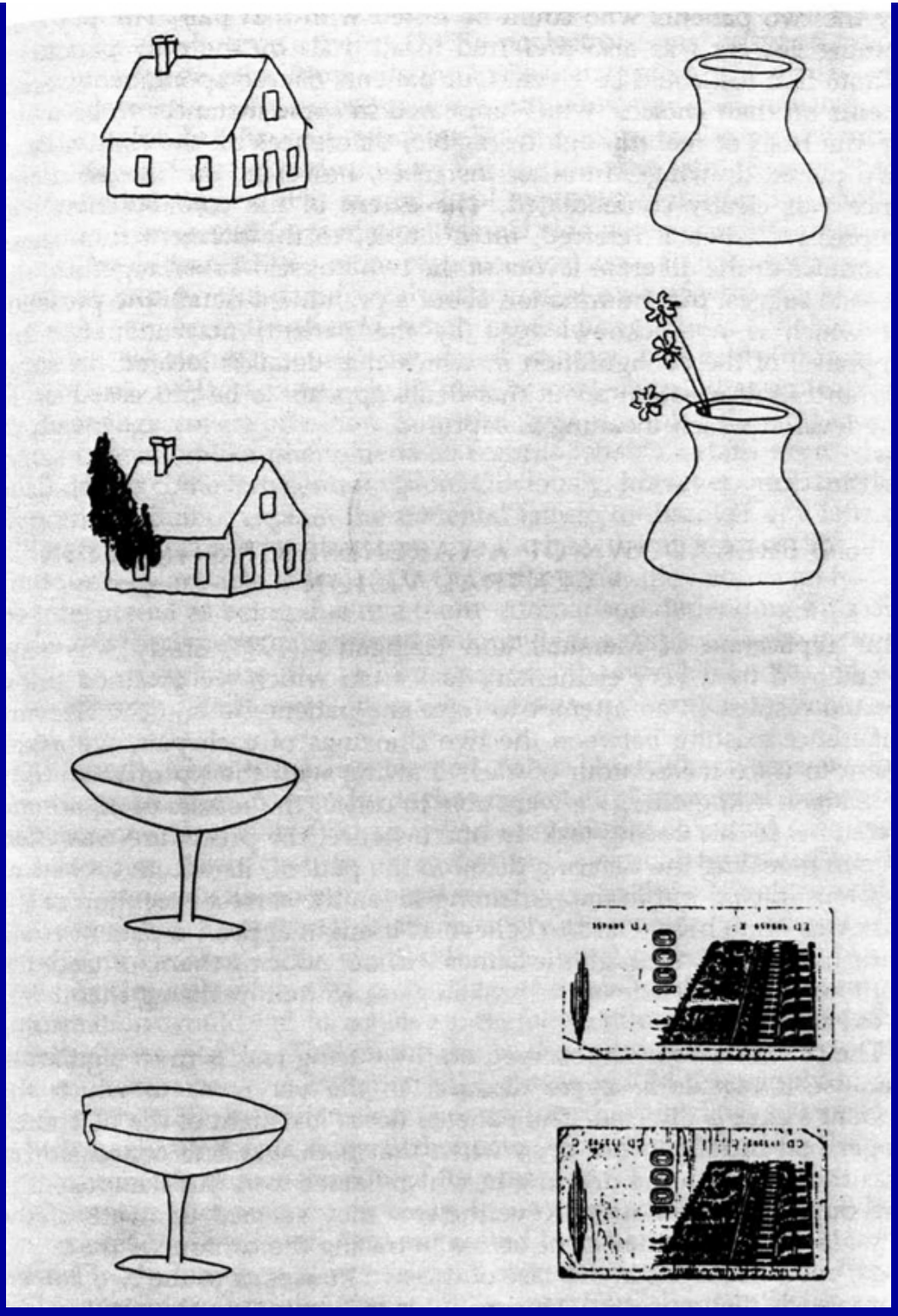


Figure 14.4 Mean reaction time to detect the targets in the moving condition as a function of end state for control subjects and for patients. Error proportion for all except P5 are shown in brackets. The Y-axis of percentage errors on right side applies only to P5.

Image used with permission. Source: Behrmann, M., and S. Tipper. "Object-Based Attentional Mechanisms: Evidence from Patients with Unilateral Neglect." In *Attention and Performance XV: Conscious and Nonconscious Information Processing*. Edited by C. Umlità and M. Moscovitch. MIT Press, 1994. ISBN: 9780262210126.

Levels of attention & consciousness

- to what level is information in neglected field processed?



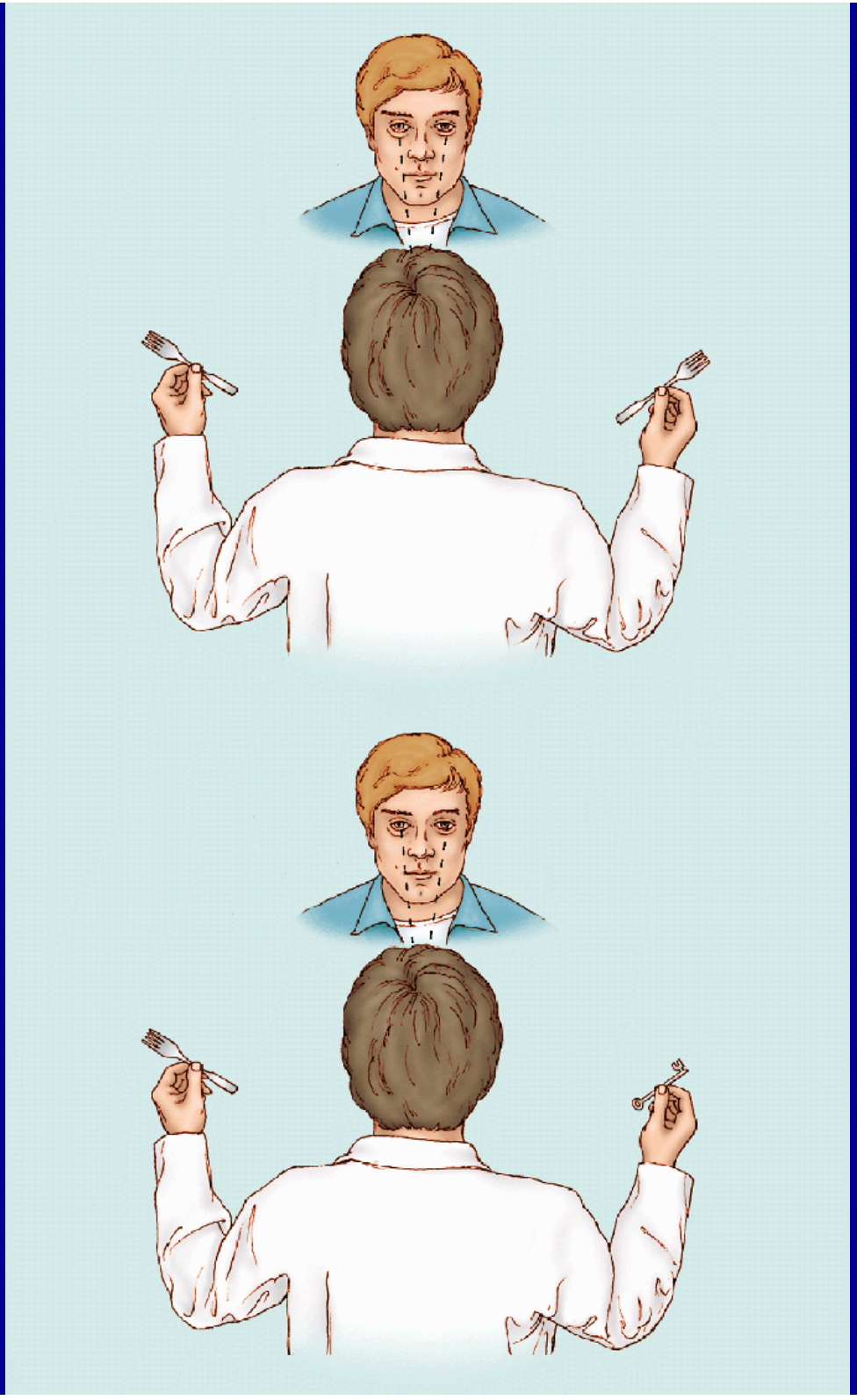
Conscious report
no difference

Unconscious preference

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Does object identity matter for neglect?

If it does, one must know what object is in neglected VF



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9.00 Learning

Professor John Gabrieli

Recent Research on Effective Study

- Test First, Study Later

- Testing Yourself on Material More Useful Than Continued Study

(ok to have wrong answers)

LEARNING

- how behavior changes within the lifespan of an individual
- everything we know that is not genetically given
- how to predict the *future* on the *basis* of past experience
- to imbue the world with *meaning*
- learning about learning through scientific psychology

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

Ivan Pavlov (1849-1936)

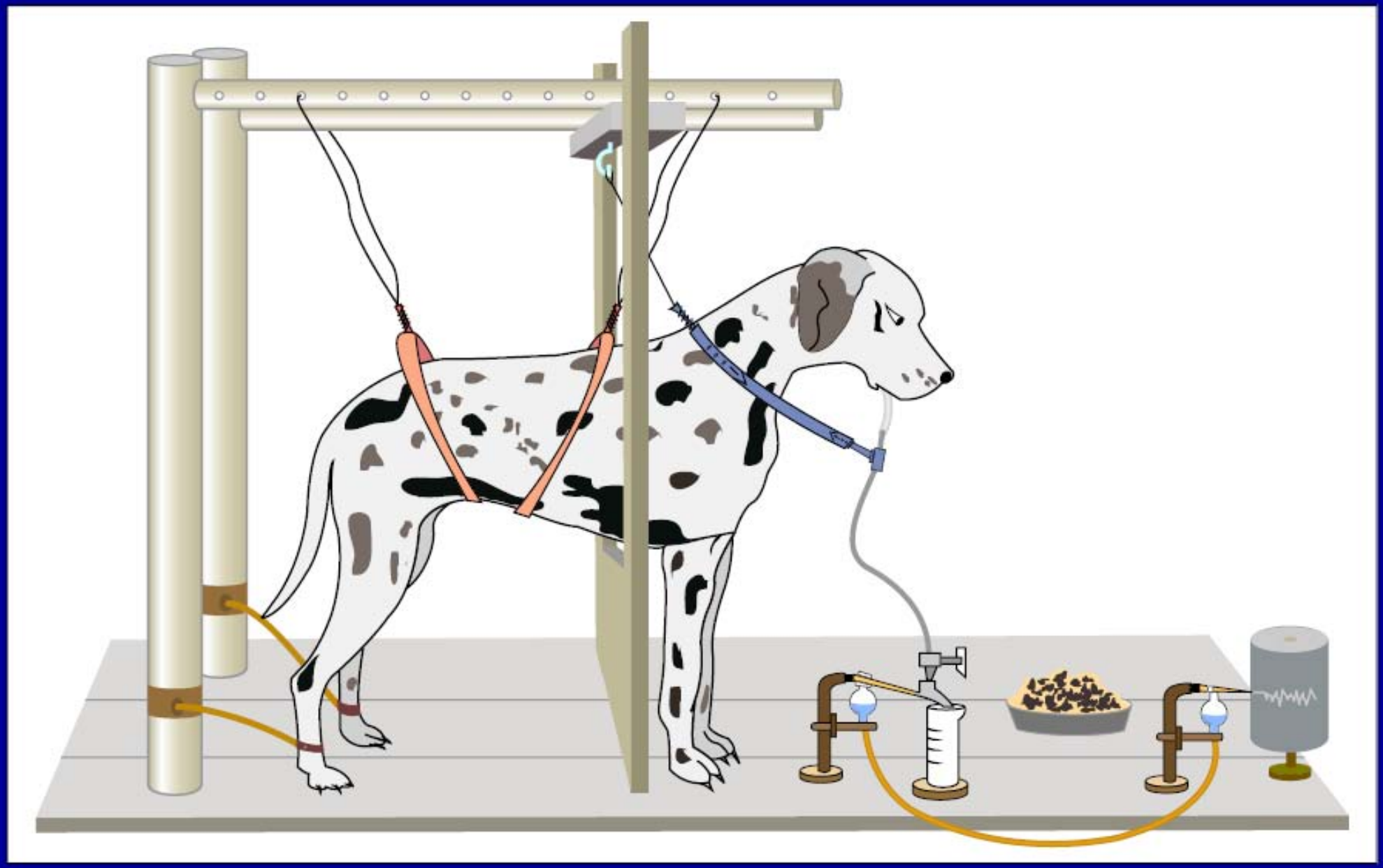
- Nobel Prize for reflexes of digestion - food in mouth provokes specific salivation to prepare for digestion - salivation *reflexes*

"But Professor, there's a revolution going on with shooting in the streets."

"What difference does it make when you've work to do in the laboratory? Next time there's a revolution, get up earlier!“

- cut esophagus so food could not go to stomach
- placed food in dog's mouth, stomach secreted plenty of gastric juice
- sight of food or sight of feeder - psychic secretions or conditioned reflex

PAVLOVIAN CONDITIONING

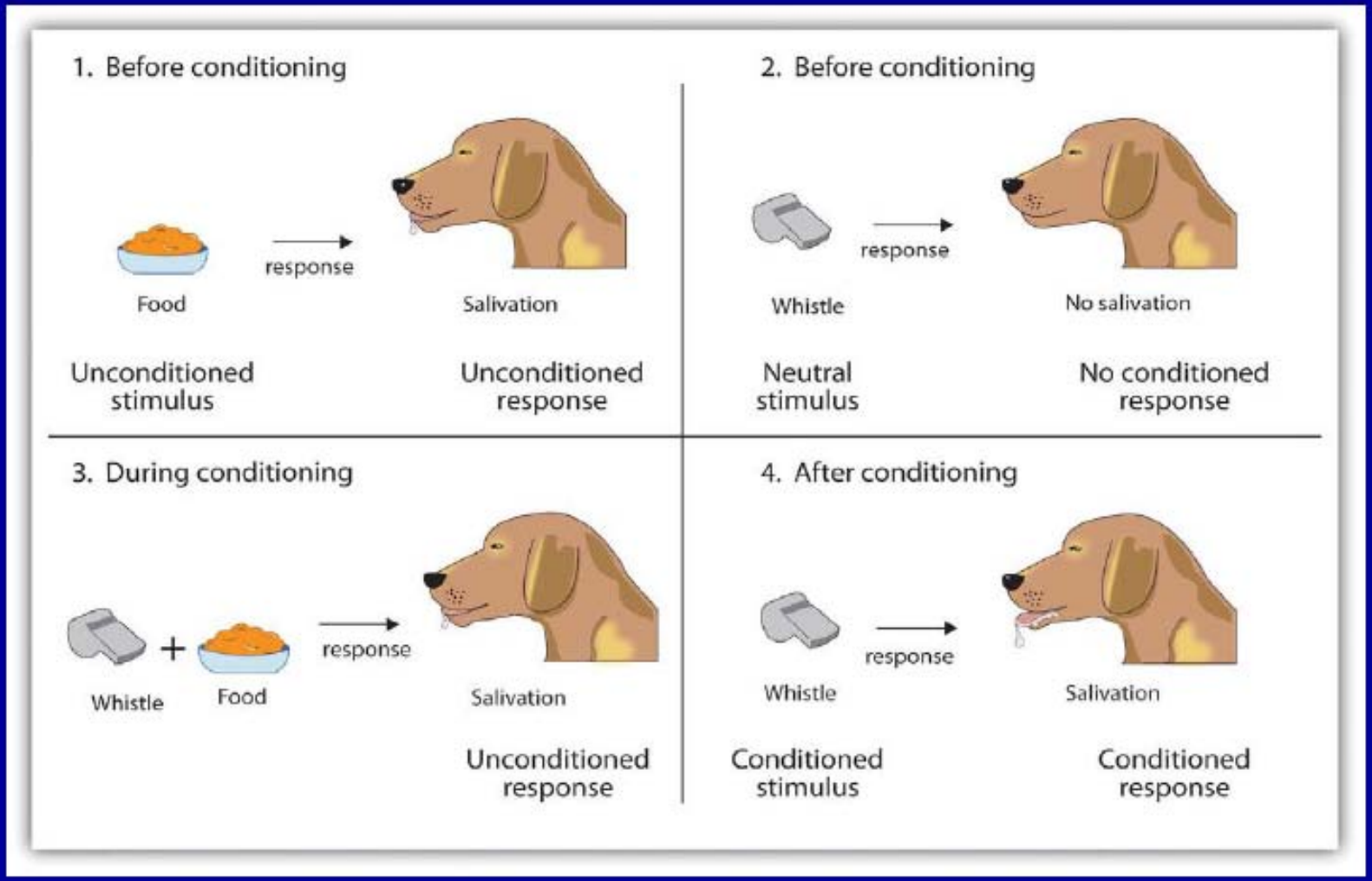


A modification of Pavlov's method

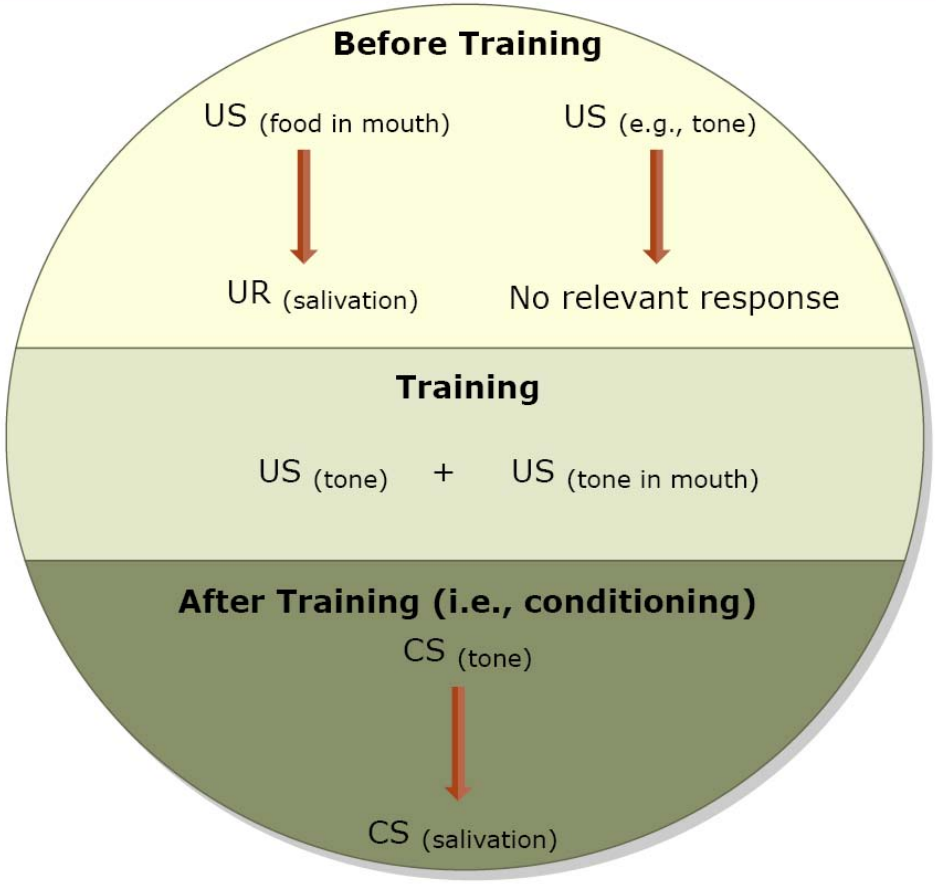
Image by MIT OpenCourseWare.

- Unconditioned Stimulus (UCS) – food
- Unconditioned Response (UCR) - salivating (food)
- Conditioned Stimulus (CS) – bell
- Conditioned Response (CR) – salivating
- *new association !!* bell (CS) & salivating (CR)
- law of association by contiguity (Aristotle)

Classically Conditioning a Salivation Response



Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.



The relationship between CS, US, CR, and UR in classical conditioning.

Image by MIT OpenCourseWare.

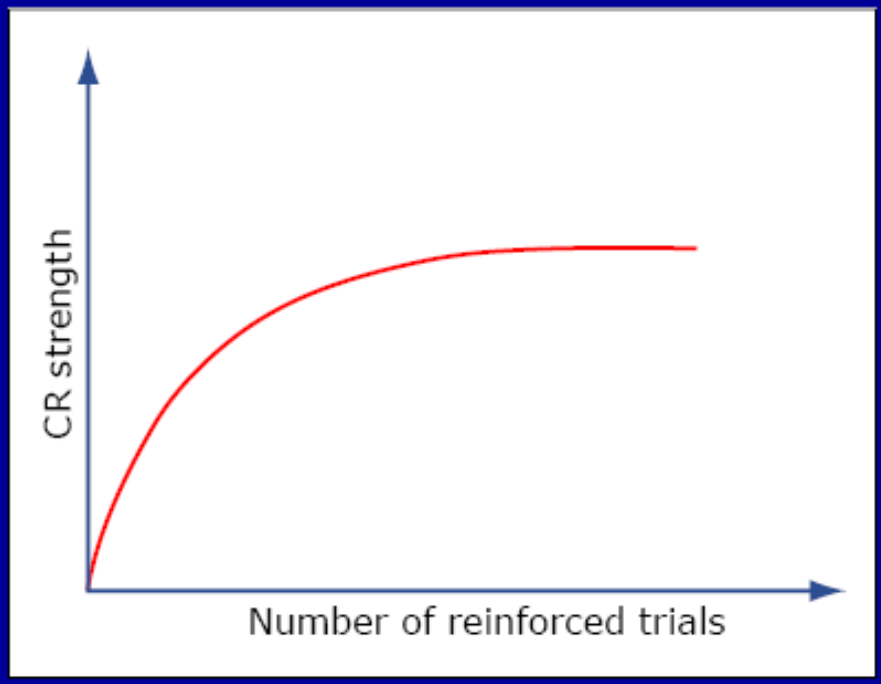


Image by MIT OpenCourseWare.

Ivan Pavlov & His Dogs

- http://www.youtube.com/watch?v=hhqumfpxuzI

- **how to predict the *future* on the *basis* of past experience**

 bell---food---salivation

- **to imbue the world with *meaning***

 bell---means that food is near

 (any UCS worked)

Water Demo

- **Unconditioned Stimulus**
 (UCS) - water in face
- **Unconditioned Response**
 (UCR) - flinching to water

UCS-UCR association is built-in reflex

- **Conditioned Stimulus**
 (CS) - hearing "CAN"
- **Conditioned Response**
 (CR) - flinching to "CAN"
- ***new association !!***
 CAN (CS) & flinching (CR)

Balloon Demo

- **Unconditioned Stimulus**
 (UCS) - balloon noise
- **Unconditioned Response**
 (UCR) - flinching

UCS-UCR association is built-in reflex

- **Conditioned Stimulus**
 (CS) - needle touching balloon
- **Conditioned Response**
 (CR) - flinching to needle
- ***new association !!***
 needle (CS) & flinching (CR)

PROPERTIES OF CLASSICAL CONDITIONING

- extinction
- generalization gradient
- discrimination training

 black (CS+) & gray (CS-) squares
- second-order conditioning

 bell (CS)

 bell (US) & black square (CS)
- is temporal contiguity the basis of classical conditioning?

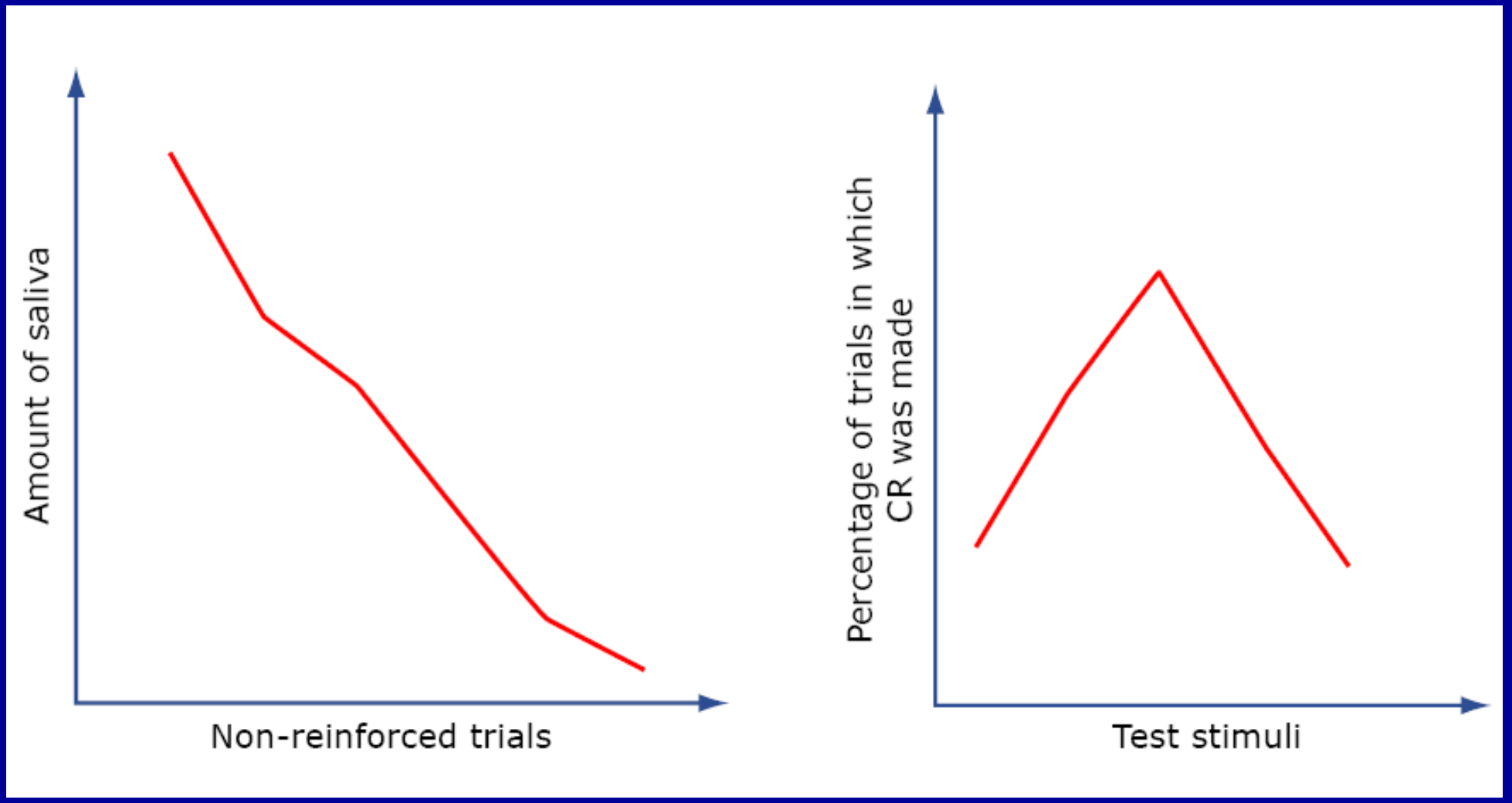
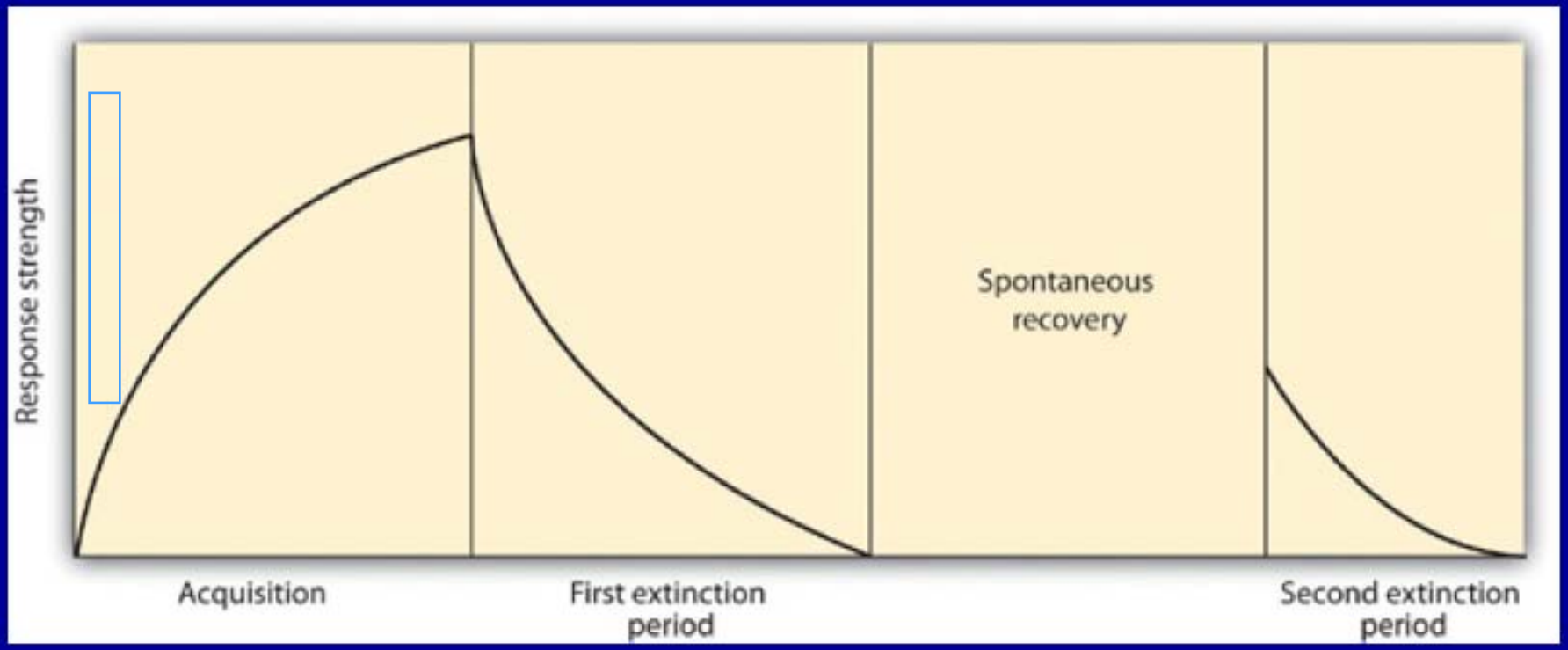


Image by MIT OpenCourseWare.

EXTINCTION

GENERALIZATION

Acquisition, Extinction, and Spontaneous Recovery in Classical Conditioning



Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.

PROPERTIES OF CLASSICAL CONDITIONING

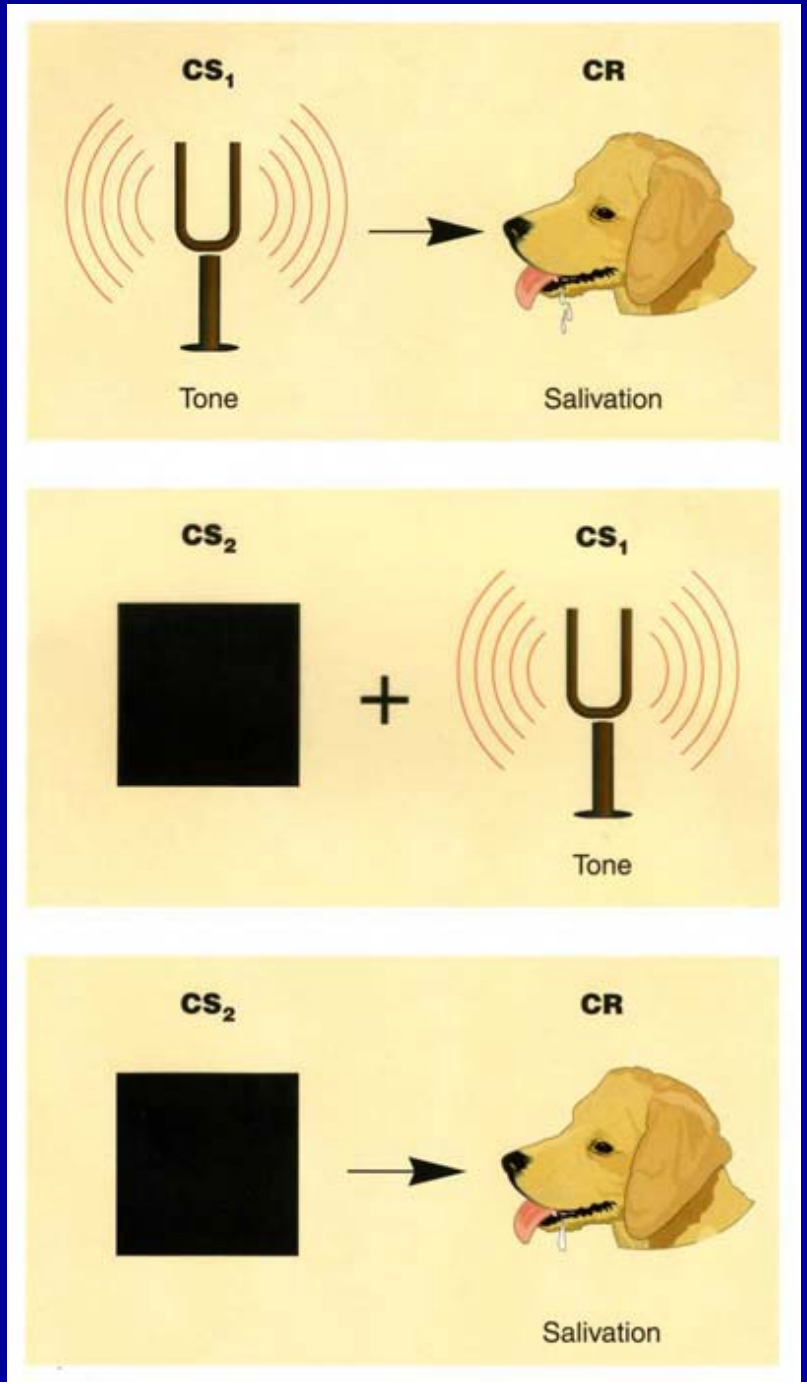
- extinction
- generalization gradient
- discrimination training

 black (CS+) & gray (CS-) squares
- second-order conditioning

 bell (CS)

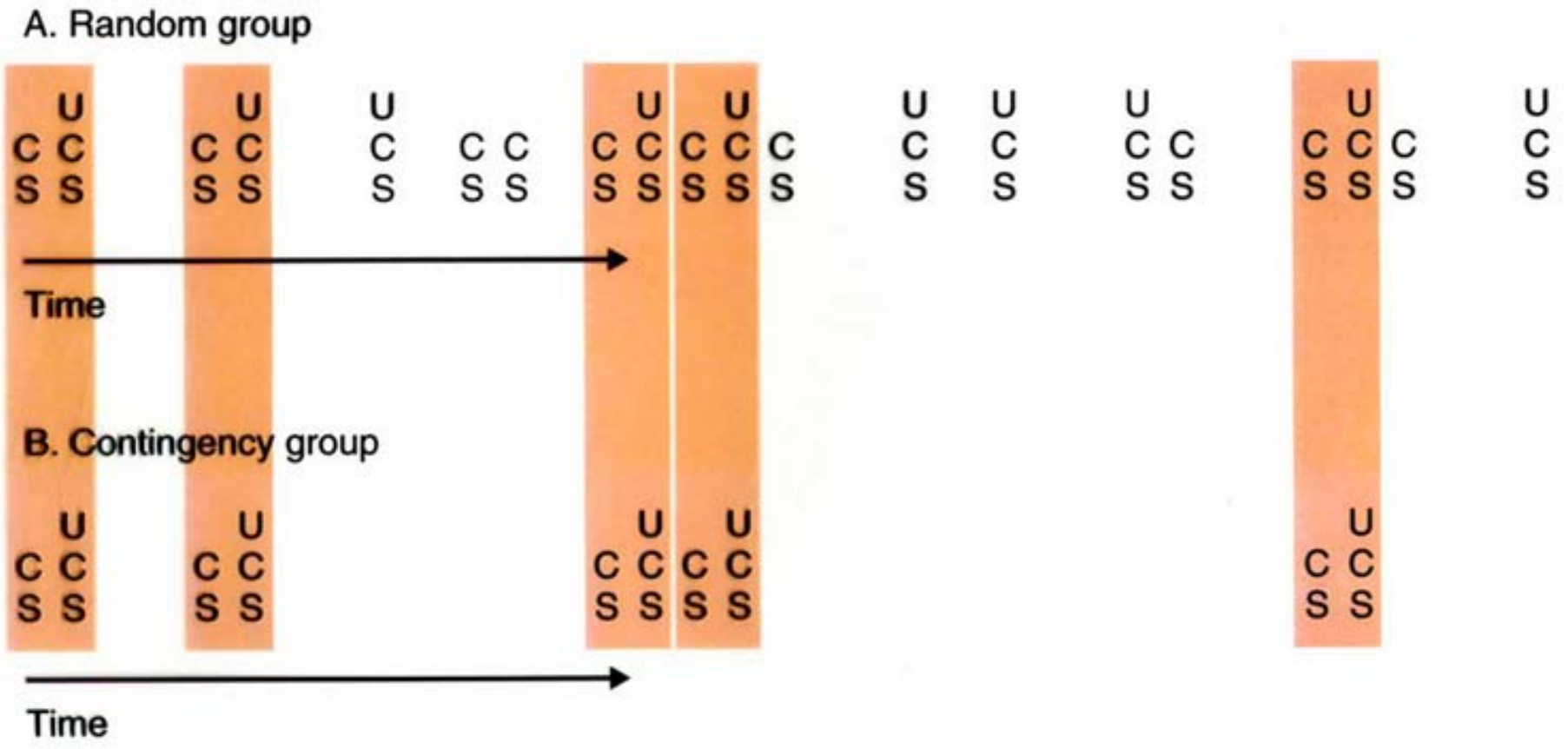
 bell (US) & black square (CS)
- is temporal contiguity the basis of classical conditioning?

Second Order Conditioning



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CONTINGENCY



Rescorla's Procedure for Demonstrating the Importance of Contingency

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- **cognitive conditioning: *Blocking***
 contiguity vs. contingency

CS1	CS1 + CS2	CS2
tone (food)	tone + light (food)	light (food)

less conditioning to CS2

	CS1+ CS2	CS2
	tone + light (food)	light (food)

more conditioning to CS2

Demo

- **how to predict the *future* on the *basis* of past experience**

 bell---food---salivation
- **to imbue the world with *meaning***

 bell---means that food is near

 (any UCS worked)

Why do we work hard? (where is the UCS?)

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

INSTRUMENTAL/OPERANT CONDITIONING

operate as instruments to produce desired effect

E. L. Thorndike (1898)

puzzle box - cat had to unlatch door by pulling latch - trial and error - fewer errors over time -

where is US?

consequence of response

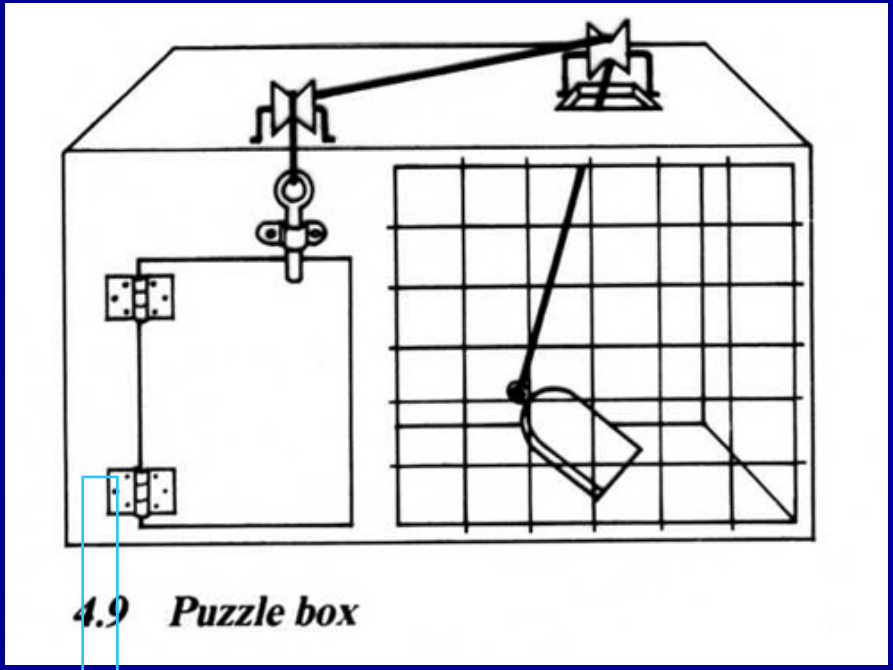
- Law of Effect

 consequence of a response determines whether it is strengthened or weakened

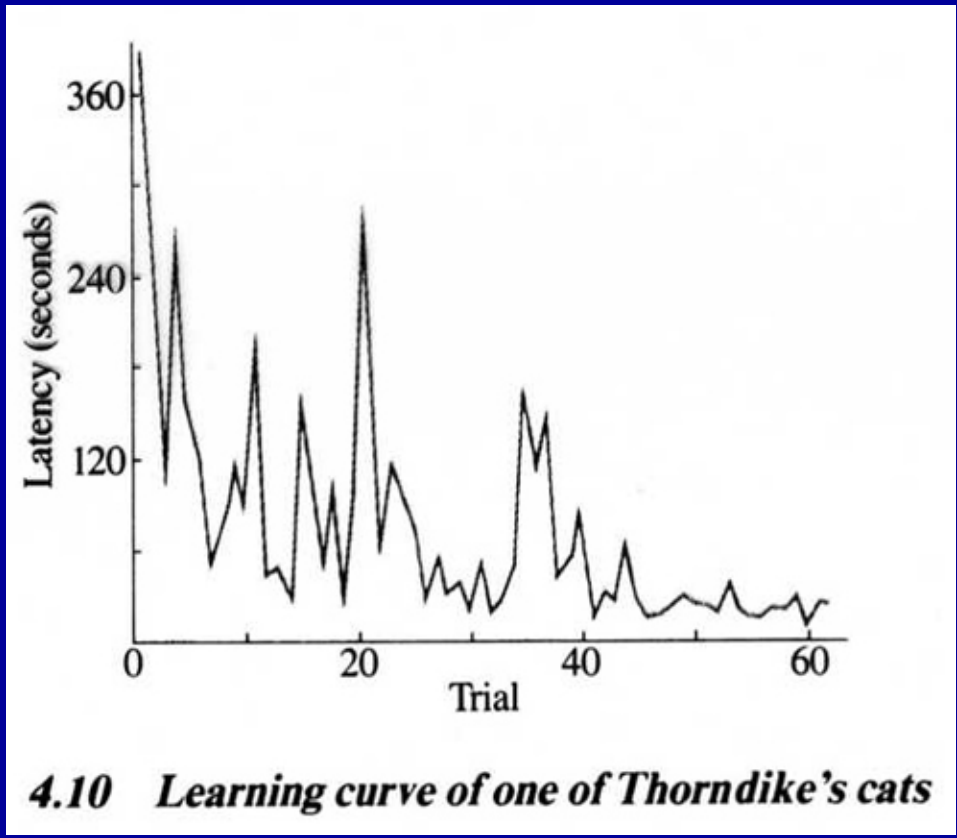
Reward - Strengthened

No Reward - Weakened

Punishment - Very Weakened



4.9 Puzzle box

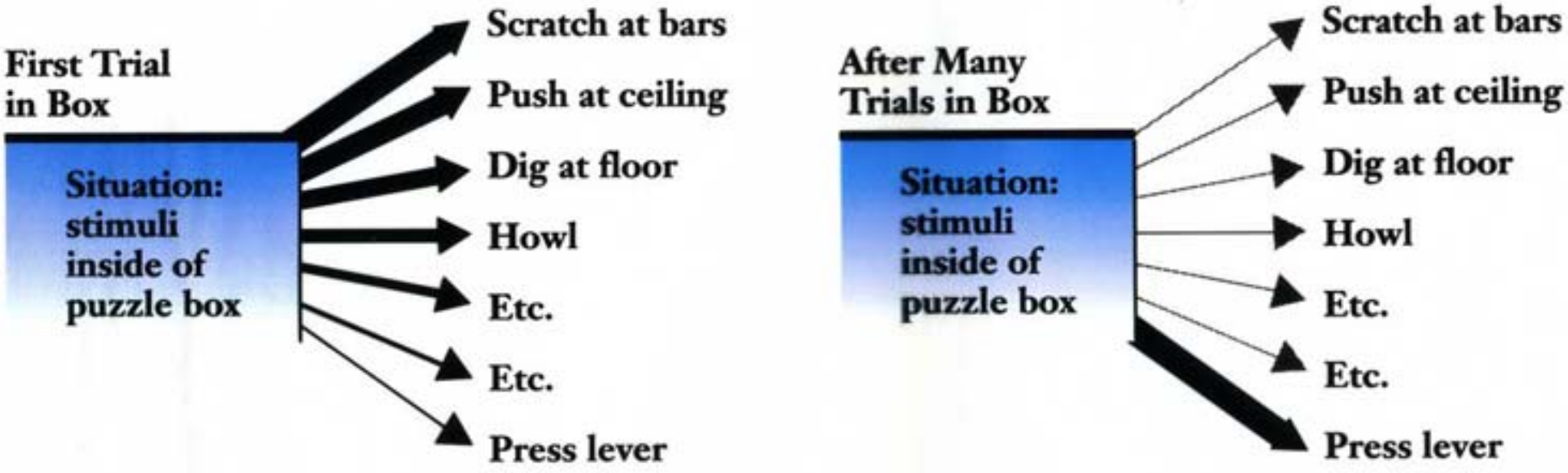


4.10 Learning curve of one of Thorndike's cats

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Transparency 21
Figure 5.7, page 132
Thorndike's law of effect

Gray: Psychology, Second Edition
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consequence of a response determines whether it is strengthened or weakened

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John B. Watson (1878-1958)

- University of Chicago/Johns Hopkins
- "mind" unobservable
- *behaviorism*
- study behavior = observable actions, not the mind
- identify environmental conditions
- no fundamental difference between animals and humans
- describe lawful relations between environment-behavior reflexes

STIMULI---------RESPONSES
(environment) (behavior)

Fear Conditioning

Classical Conditioning of a Phobia: Little Albert

http://www.youtube.com/watch?v=0FKZAYt77ZM

B. F. Skinner (1904-1990)

- *consequences* of responses
- operant response is an action that operates on environment to produce some consequence
- *Beyond Freedom and Dignity*
- operant behavior

classical conditioning CS *elicits* CR

instrumental conditioing CRs are *emitted* - CRs = operants

create the CRs

OPERANT CONDITIONING

- novel response?

 successive approximations & shaping

high lever

- click & pellet
- location, click & pellet
- face lever, location, click & pellet
- stretching body upward, face lever, location, click & pellet
- touch lever with paws, stretching body upward, face lever, location, click & pellet
- press high lever, touch lever with paws, stretching body upward, face lever, location, click & pellet

INSTRUMENTAL/OPERANT CONDITIONING

operate as instruments to produce desired effect

- **Law of Effect**

 consequence of a response determines whether it is strengthened or weakened

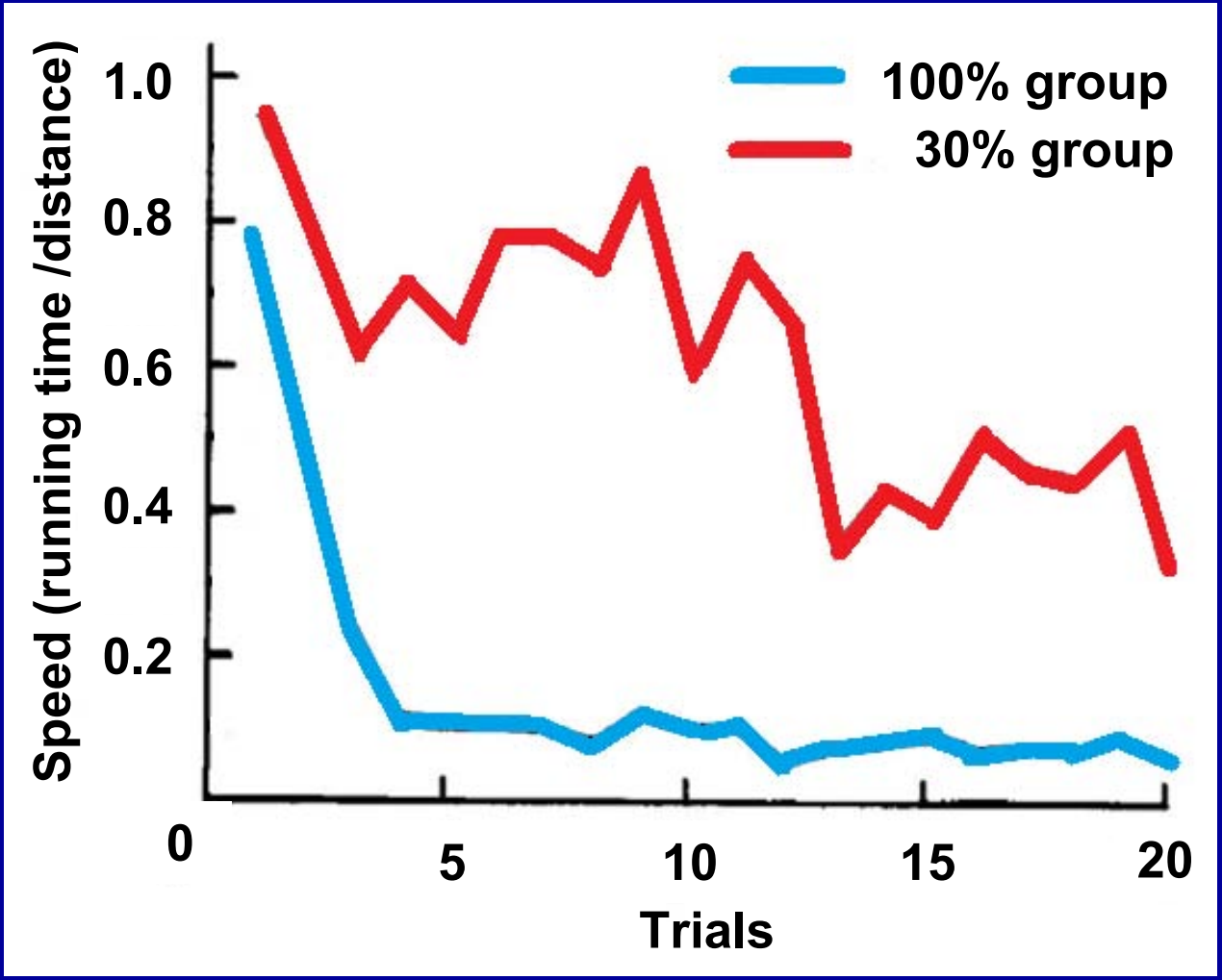
Reward - Strengthened
No Reward - Weakened
Punishment - Very Weakened

http://www.learner.org/resources/series138.html?pop=yes&pid=1529
11:37

REINFORCEMENT

- Primary Reinforcers
 food, thirst, pain
- Secondary Reinforcers
 money, attention, praise, admission, promotion
- Positive (increase behavior)
- Negative (decrease behavior, escape)
- Punishment
- Partial Reinforcement

Partial-reinforcement effect



More resistant to extinction

LEARNED HELPLESSNESS

Seligman & dogs

Phase 1

Yoked in hammock with shocks:

Group A could stop by pushing panel near nose

Group B could not stop

equal number & duration of shocks

Phase 2

avoidance learning in shuttle box

CS - tone

jump within 10 secs to avoid shocks

Group A - learns

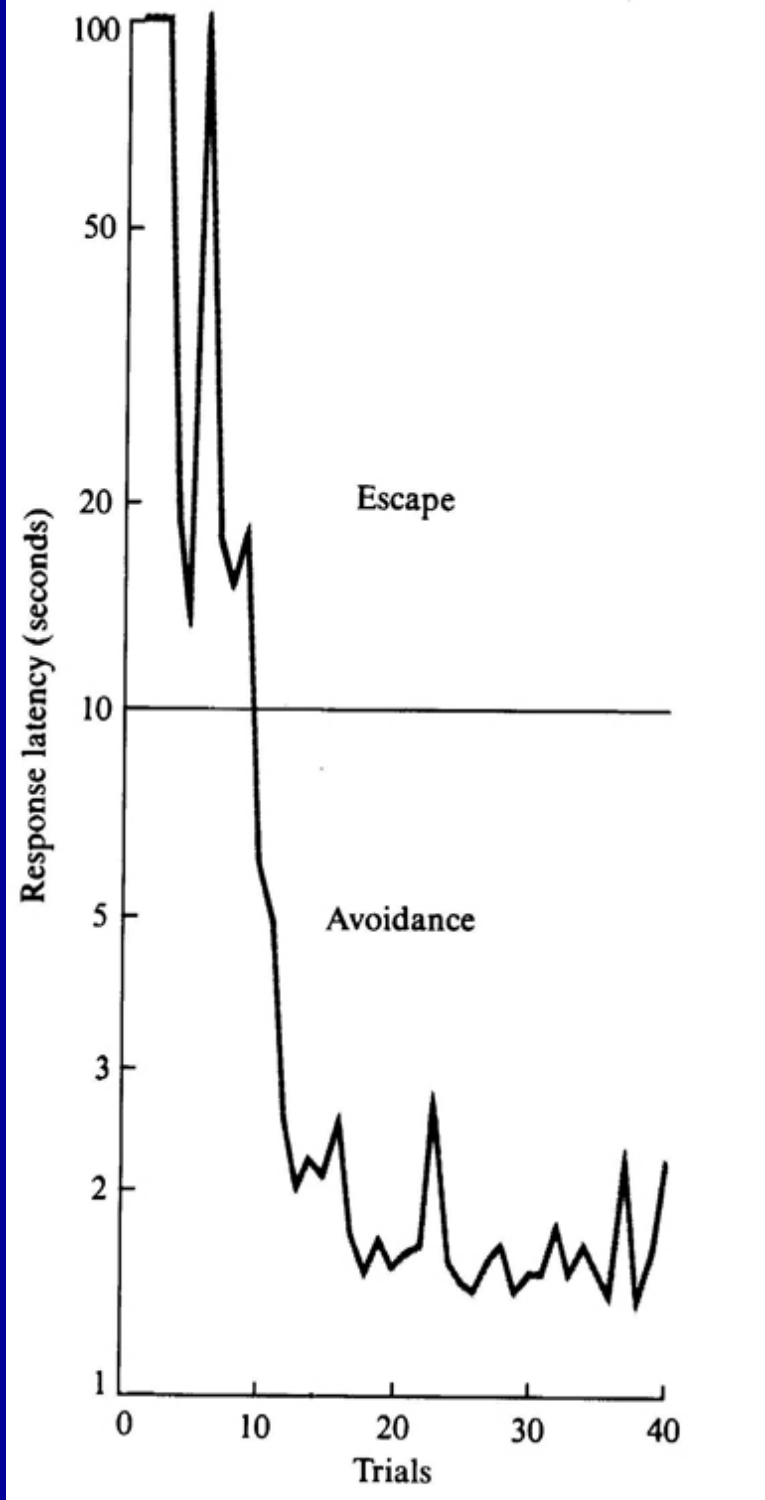
Group B - does not learn

motivational deficits **- slow to initiate known actions**

emotional deficits **- listless, frightened, distress**

cognitive deficits **- poor learning in new situations**

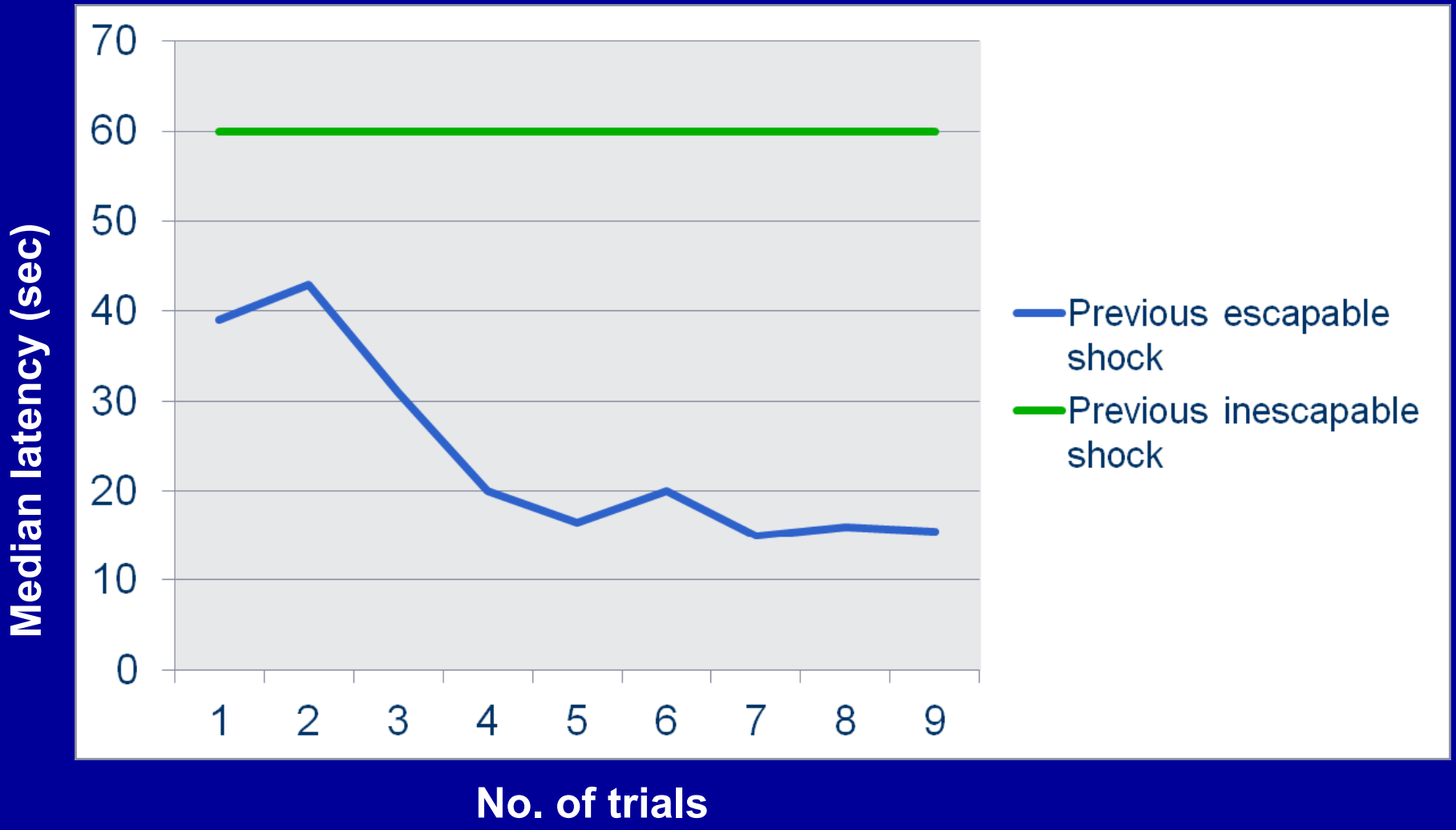
Avoidance of Shock by Dogs



4.23 The course of avoidance learning in a dog

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Learned Helplessness



Depression & People?

how we explain life to ourselves

- internal-external
- global-specific
- stable-unstable

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

LIMITS TO CONDITIONING

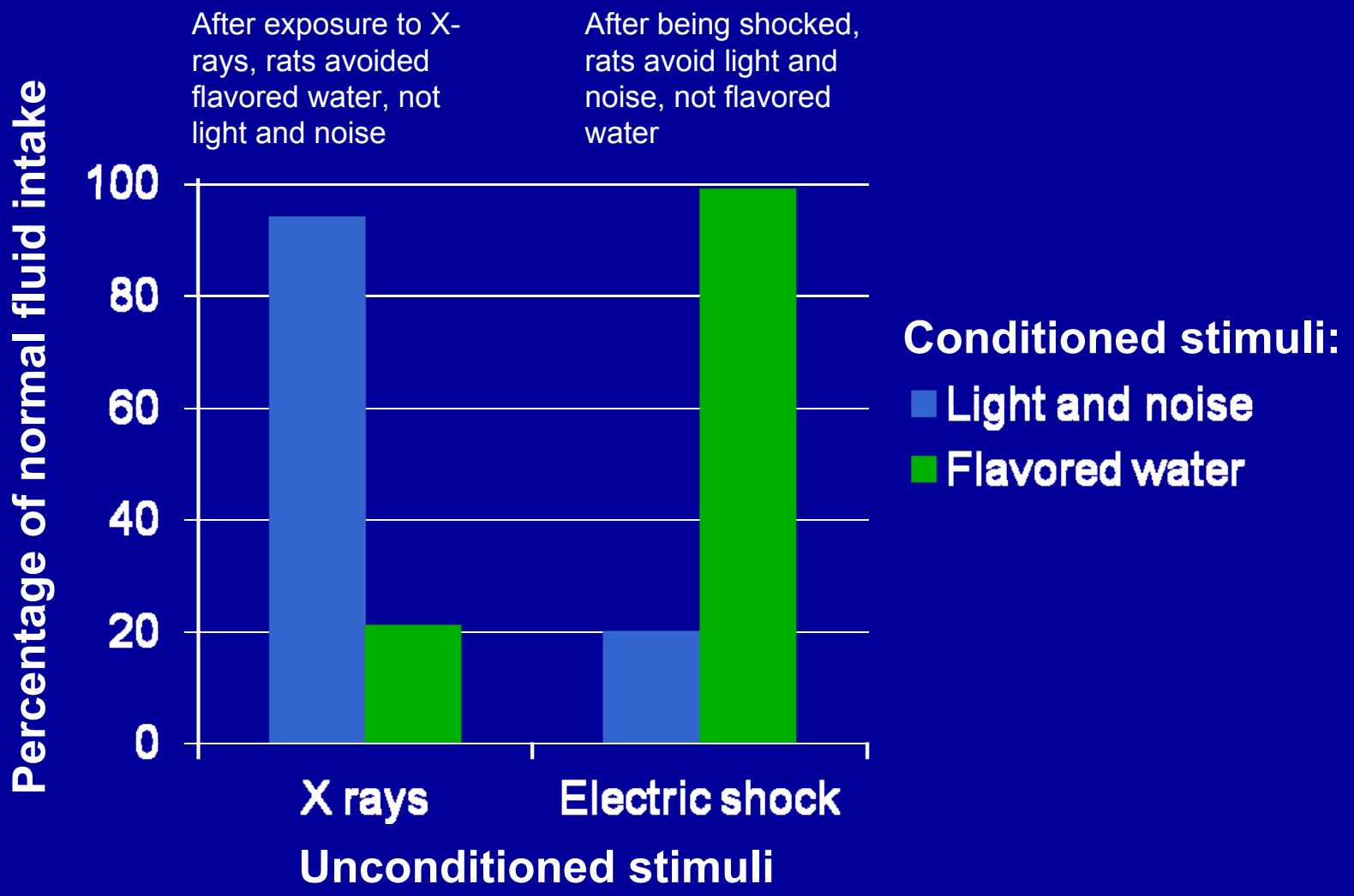
- preparedness
- latent learning
- contingency
- reward value
- delayed gratification
- when reward harms
- language

Results of Garcia and Koelling's Experiment - Taste Aversion

Type of Aversive Stimulus		
Type of Water	**Received Shock**	**Received X-ray/lithium chloride**
		
Bright-noisy water 	Avoided bright-noisy water, but not sweet water	No evidence of classical conditioning
Sweet water 	No evidence of classical conditioning	Avoided sweet water, but not bright-noisy water

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Characteristics of the Conditioned Stimulus and the Unconditioned Stimulus Affect the Acquisition of the Conditioned Response



Preparedness

Picture - CS

snakes/spiders or flowers/mushrooms

Shock - US

UR - GSR (sweat)

Better conditioning for snakes/spiders

Preparedness

Little Albert Study

rat - worked

wooden block, piece of cloth

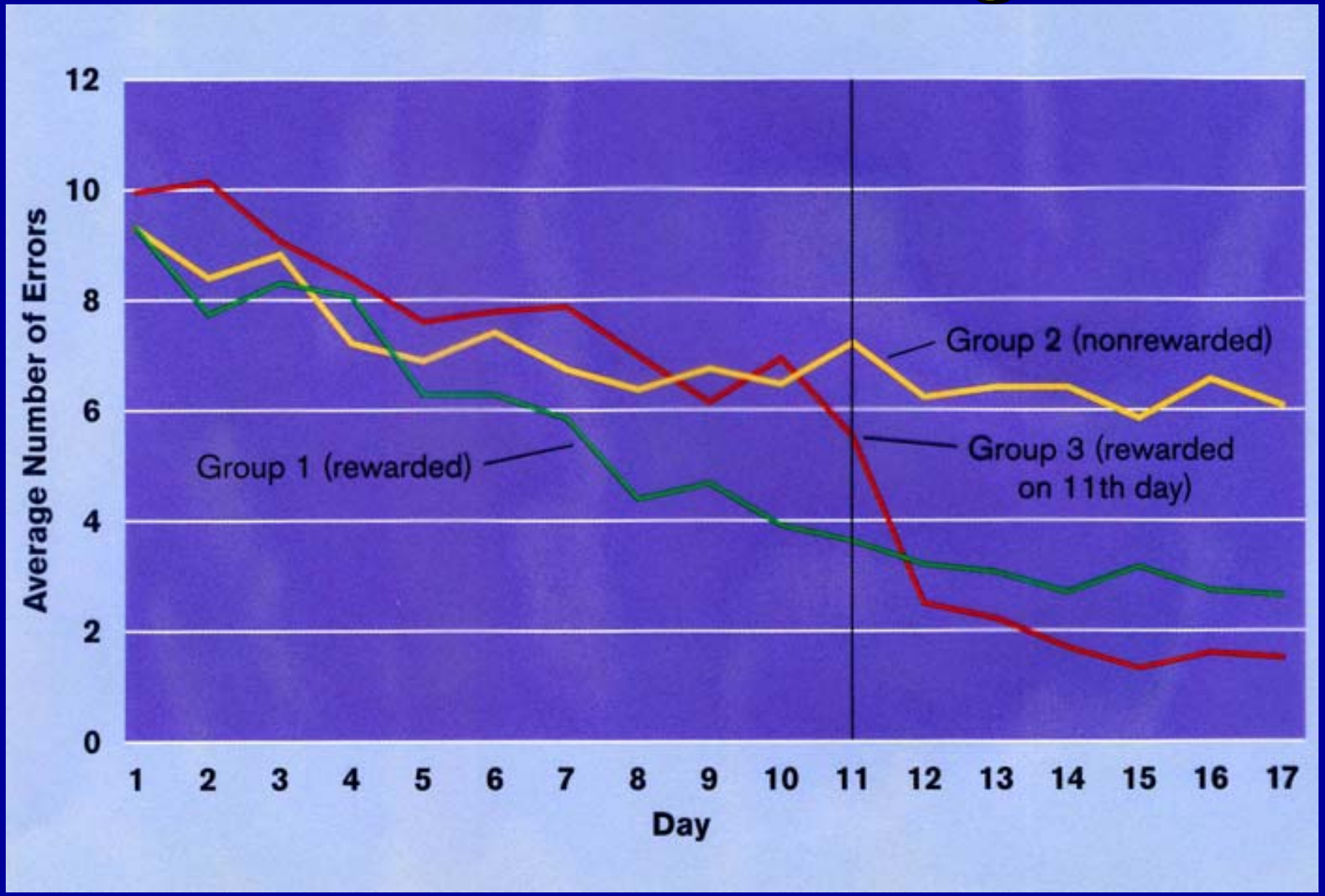
did not work

LATENT LEARNING

3 groups of rats in goal maze

- food reward every day
- no rewards
- no rewards for 10 days; then reward

Latent Learning



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Tolman & Honzik (1930)

CONTINGENCY

- 2-month-old infant/crib/color mobile
- moving head, switch in pillow/smile & coo
- second group/no control/no smile, no coo despite equal number of mobile turns

Reward Value

- negative contrast

What happens when you switch to a worse reward?

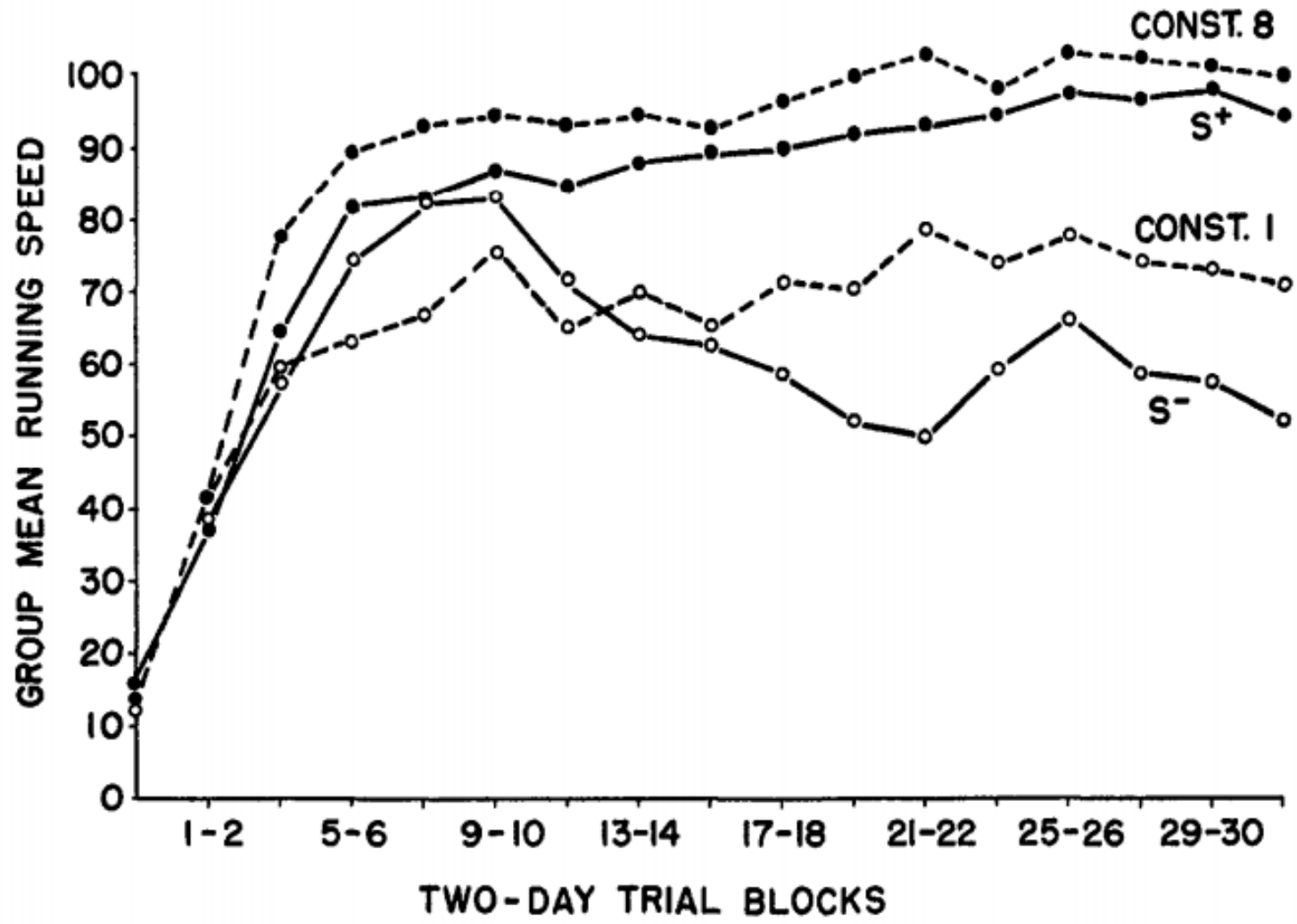


FIG. 1. Group average running speed plotted in blocks of two days. (The dashed curves represent performance of the Constant reward control groups; the solid curves represent performance of the Contrast group in S^+ and in S^-.)

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DELAYED GRATIFICATION

- 4-5 year-old children – 653 children of faculty and graduate students
- two snacks

 one or two marshmellows
- wait 15 minutes to get two – 30% waited 15 minutes
- correlated 10 years later with behavioral problems, academic and social success (210 SAT points for 30 sec vs. 15 min delay)

WHEN REWARDS HARM

rat & running wheel

run for fun

run for food - no longer will run for fun

preschoolers draw for fun

gold stars (conditioned reinforcer)

no gold stars, no drawing

Is Language Learning A Conditioned Skill?

- 1 month - switch inside rubber nipple - hooked to tape recorder - when baby sucks, tape plays - *ba ba ba* vs. *pa pa pa* - may not be in their own language (Kikuyu/Spanish) and which their parents may be unable to distinguish (Czech, Hindi, Inslekampx)
- at 4 days, a French baby prefers French to Russian, Italian, backwards French
- correction/reinforcement?

 2-year-old: "Mamma isn't boy, he a girl."

 Mother" "That's right."
- generative - sentences are produced that are unique
- everybody learns it without training
- overgeneralizing - "My teacher holded the rabbit."

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Lecture and Sacks Questions

1. A study examined the "broken windows" theory that people are more likely to violate social norms when they observe that others violate social norms. White flyers were attached to bikes next to a wall with or without graffiti, and littering was measured as the number of flyers thrown to the ground. Littering occurred twice as often when graffiti was present. In this study,

A. presence/absence of graffiti was the dependent variable, littering was the independent variable, and the study was experimental in design

B. presence/absence of graffiti was the independent variable, littering was the dependent variable, and the study was experimental in design

C. presence/absence of graffiti was the independent variable, littering was the dependent variable, and the study was correlational in design

D. presence/absence of graffiti was the dependent variable, littering was the dependent variable, and the study was correlational in design

B

2. Does the background color of a computer monitor influence your thinking? In one study, red or blue backgrounds were presented for number of words recalled from a list (memory) and for the number of uses of a brick that were generated (creativity). Researchers found

A. blue background improved memory and creativity

B. red background improved memory and creativity

C. red background improved memory, blue background improved creativity

D. blue background improved memory, red background improved creativity

C

3. For a typical split-brain (= callosotomy) patient, if a picture of a *cup* is presented in the left visual field and a picture of a *spoon* is presented in the right visual field and the patient is asked to identify what had been presented

A. the patient would say "cup" and pick out a spoon from an array of unseen objects with the right hand

B. the patient would say "cup" and pick out a spoon from an array of unseen objects with the left hand

C. the patient would say “spoon” and pick out a cup from an array of unseen objects with the left hand

D. the patient would say “spoon” and pick out a cup from an array of unseen objects with the right hand

C

4. Evidence from split-brain patients indicates
 A. the right hemisphere is specialized for global features and the function of a visual stimulus
 B. the left hemisphere is specialized for global features and the function of a visual stimulus
 C. the right hemisphere is specialized for local features and the appearance of a visual stimulus
 D. the left hemisphere is specialized for local features and the function of a visual stimulus

 D

5. Injury to the orbitofrontal cortex in Phineas Gage primarily altered which capacity?

 A. motor control
 B. language
 C. audition
 D. character

 D

6. The brain accounts for 2% of body mass and _____% of the body’s oxygen consumption.

 A. 2%
 B. 20%
 C. 50%
 D. 80%

 B

7. A patient with impaired semantic knowledge about living things (foods and animals) but intact semantic knowledge about manufactured objects (tools) often has

 A. intact semantic knowledge about musical instruments and intact semantic knowledge about body parts

 B. impaired semantic knowledge about musical instruments and impaired semantic knowledge about body parts

C. intact semantic knowledge about musical instruments and impaired semantic knowledge about body parts

D. impaired semantic knowledge about musical instruments and intact semantic knowledge about body parts

D

8. Research supports all of the following conclusions about the perception of faces EXCEPT which conclusion?

A. infants (6 month and younger) prefer top-heavy visual displays

B. infants (6 months and younger) have better memory for human than monkey faces

C. children have better memory for faces from racial groups they see growing up than faces from other racial groups

D. faces are perceived and remembered configurally rather than part-by-part

B

9. Injury to the human amygdala impairs recognition of what facial expression?
A. fear
B. sadness

C. disgust

D. anger

A

10. When shadowing a verbal passage in one ear, which of the following is noticed in the message presented to the other, unattended ear?

A. the content of the message

B. a change from one language to another language

C. a change from a voice to a tone

D. a change from normal speech to nonsense backward speech

C

11. In visual search, preattentive search has all but which one of the following properties?

A. it guides identification of conjunctions

B. it operates in parallel

C. it produces subjective pop-out

D. it exhibits a flat slope in relation between time and set size of the display

A

12. In one study of blindsight, monkeys had ablation of the left primary visual cortex and the splenium of the corpus callosum. In the first experiment, monkeys responded to a light coming on by touching the location of the light on a monitor. In the second experiment, monkeys did the same task, but also touched a specified location when they believed that no light came on (blank trials). The findings were:

A. monkeys identified lights coming on in both visual fields in both experiments

B. monkeys identified lights coming on only in the left visual field in both experiments

C. monkeys identified lights coming on in both visual fields in the second experiment, but only in the left visual field in the first experiment

D. monkeys identified lights coming on in both visual fields in the first experiment, but only in the left visual field in the second experiment

D

13. In an experiment with infants who were cortically blind in one visual field due to hemispherectomies, the infants saw a central target, and then a peripheral target in either the good or bad visual field. In the Competition condition, the central target remained on while the peripheral target was shown. In the Non-Competition condition, the central target disappeared when the peripheral target was shown. The infants were tested at several times as they developed. The key findings were that:

A. infants seldom looked at the peripheral targets in the blind field in either the Competition or Non-Competition conditions

B. infants almost always looked at the peripheral targets in the blind field in both the Competition and Non-Competition conditions

C. as they developed, the infants usually looked at the peripheral targets in the blind field in the Non-Competition condition, but seldom in the Competition condition

D. as they developed, the infants usually looked at the peripheral targets in the blind field in the Competition condition, but seldom in the Non-Competition condition

C

14. A variety of results, including results from a spatial cuing task from Posner, indicate that patients with spatial neglect due to right posterior lesions have a primary deficit in

A. disengaging attention from the left field

B. disengaging attention from the right field

C. engaging attention in the right field

D. engaging attention in the left field

B

15. Many studies aim to show that neglect is based on a deficit of attention, not a simple loss of perception. All of the following findings support that neglect is different than simple loss of vision EXCEPT which one finding?

A. neglect occurs in imagined spatial locations

B. patients with neglect fail to respond to stimuli in the half of the world opposite their injury

C. patients with neglect show normal preferences for objects based on information in the neglected field

D. neglect follows the 180-degrees rotation of a display into the intact hemifield

B

16. In conditioning, partial reinforcement (relative to constant reinforcement) leads to learning that

A. occurs slower, and is more resistant to extinction

B. occurs faster, and is less resistant to extinction

C. occurs faster, and is more resistant to extinction

D. occurs slower, and is less resistant to extinction

A

17. Which finding or findings below do NOT challenge the claims of behaviorism that conditioning could relate any conditioned stimulus to any conditioned response?

A. evidence that rats on their own would relate nausea to taste and shock to lights and sounds

B. evidence that Little Albert learned fear conditioning to animals but not wooden bocks

C. evidence that people are more prepared to relate shocks to snakes than flowers

D. evidence that second-order conditioning can occur

D

18. Sacks describes two women, Mrs. O'C and Mrs. O'M, with "musical epilepsy" in which the women experienced hearing songs due to pathology in the _____, and Donald, who could not remember killing his girlfriend while under the influence of PCP but after contusions around the _____ appeared to recover memory for the murder.
A. temporal lobe; frontal lobe

B. frontal lobe; parietal lobe

C. parietal lobe; temporal lobe

D. frontal lobe; temporal lobe

A

19. Sacks describes Professor P, a musician who became a prosopagnosic patient. Professor P failed to recognize all of the following, except for one. Select the one answer below describing something Professor P could recognize by sight.
A. abstract shapes like a cube
B. a rose
C. faces of his family
D. emotional expression of faces in movies
A

20. Sacks describes Mrs. S., who exhibits spatial neglect. What things did NOT help her overcome her neglect?
A. swiveling her head to find food on her plate
B. a rotating wheelchair
C. developing an intellectual strategy to notice things to her left
D. a video system for her make-up
D

Book Questions

21.All of the following comparisons of groups would necessarily be made using a quasi-experimental design EXCEPT:

A. men vs. women

B. cancer patients vs. non-cancer patients

C. individuals born in Korea vs. those born in the US

D. individuals exposed to a violent film vs. those not exposed to this film

Answer: D
Page Ref: 47

22.*Reliability* refers to the:

a. validity of data.

b. values of data.

c. levels of data.

d. consistency of data.

Answer: D
Page Ref: 49

23. An experiment is said to have *construct validity* if:

A. it produces reliable findings.

B. its findings can be replicated.

C. its findings are consistent across experiments.

D. it measures what the investigator designed it to measure.

Answer: D
Page Ref: 49

24._____ bias occurs when participants or items are not chosen at random but instead are selected so that an attribute is over- or under-represented.

A. Response

B. Reliability

C. Validity

D. Sampling

Answer: D
Page Ref: 51

25. _____ occur(s) when an investigator's beliefs lead him or her to treat participants in a way that encourages them to produce the anticipated results.

A. Sampling bias

B. Response bias

C. Experimenter expectancy effects

D. A double blind design

Answer: C
Page Ref: 52

26.Which measure of central tendency is least affected by extreme scores?

A. mean

B. median

C. range

D. standard deviation

Answer: B
Page Ref: 56-57

27.Phrenology was an early attempt at explaining how the mind arises from the brain. Phrenology was rejected when which of the following claims was shown to be false?

A. The shape of the skull's outer surface is influenced by the size of underlying brain structures.
B. Most personality traits are the result of many brain regions in combination.
C. Functions of the brain related to thinking and personality are located in the cerebral cortex.
D. Different brain regions are specialized for different mental faculties.

A, p93

28.Magnetoencephalography (MEG) is a powerful technology for brain imaging because it has good resolution both to the timing of neural events and, to a lesser extent, the location of those events in the brain. Which other brain imaging technologies also offer good temporal and spatial resolution?

A. fMRI = good temporal resolution, EEG = good spatial resolution

B. TMS = good spatial resolution, PET = good temporal resolution

C. EEG = good temporal resolution, fMRI = good spatial resolution

D. PET = good spatial resolution, CT = good temporal resolution

C, pp109-113

29.Although it is much smaller, the cerebellum has as many neurons and nearly as much surface area as the cerebrum. What sorts of disorders might you expect in a patient with cerebellar lesions?
A. Trouble making coordinated movements like walking or reaching.
B. Auditory hallucinations of music or voices.
C. Spatial neglect of the contralateral hemisphere.
D. Difficulty suppressing socially inappropriate behaviors like swearing or gambling.

Ans: A, p103

30.If psychologists reported that individuals' performance on a test of spatial reasoning is 75% heritable, which of the following is true of spatial reasoning abilities?
A. If a parent has good spatial reasoning abilities, his children will have a 75% chance of having good spatial reasoning abilities, too.
B. In any given person, genes contribute 75% of their spatial reasoning abilities, while the environment contributes the remaining 25%.
C. 75% of the population has good spatial reasoning abilities.
D. 75% of the population variability in spatial reasoning is related to genetic factors.

Ans: D, p122

31.Not all behaviors are voluntary or "willful". Motor reflexes often occur as soon as, or even before, we are aware of the stimuli that caused them. Which of the following is an example of an unconscious reflex circuit?
A. Sensory neurons → Cerebellum → Motor response
B. Cerebral cortex → Brain stem → Motor response
C. Sensory neurons → Spinal interneurons → Motor response
D. Sensory neurons → Basal ganglia → Motor response

Ans: C, p91

32.How is information from the eyes mapped onto visual cortex?
A. The left eye sends information exclusively to the right hemisphere; the right eye sends information exclusively to the left hemisphere.
B. Both eyes send information from the right visual field to the left hemisphere and information from the left visual field to the right hemisphere.
C. The left eye sends information from the left visual field to the right hemisphere and from the right visual field to the left hemisphere; while the right eye sends information from the left visual field to the left hemisphere and from the right visual field to the right hemisphere.
D. Both eyes send information from the left visual field to the left hemisphere, and information from the right visual field to the right hemisphere.

Ans: B, p98

33.Which is true about the organization and/or representation of visual information in primary visual cortex?

A. Primary visual cortex is organized into columns of orientation-selective neurons

B. The fovea and periphery map onto visual cortex in proportion to the amount of space they take up in the retina

C. Neurons in primary visual cortex are NOT selective for specific attributes of visual stimuli, such as bar orientations

D. The left visual hemifield is retinotopically represented in the left hemisphere.

Answer: A
Page 145

34.Which of the following is NOT used to reconstruct a 3D world from a 2D retinal image?

A.Retinal disparity
B.Motion parallax
C.Convergence
D. Gestalt similarity

Answer: D
Page 150, Fig. 4.14

35.Attention is often described in terms of “bottom-up” and “top-down” components. In the context of visual search, _____ can be used to engage _____ while _____ engages _____.

A.Conjunction search; bottom-up attention; pop-out search; top-down attention.
B.Conjunction search; top-down attention; pop-out search; bottom-up attention.
C.Pop-out search; top-down attention; conjunction search; vigilance.
D.Pop-out search; bottom-up attention; conjunction-search; vigilance.

Answer: B
Pages 157-158

36._____is a rebound period in which a person cannot pay attention to a **different** stimulus after having just paid attention to another stimulus.
A. Vigilance
B. Change blindness
C. Repetition blindness
D. Attentional blink

D, p. 157

Page 162

37.Pheromones are a class of chemical signals used by animals to communicate via olfaction. Some studies suggest that pheromones can influence human behavior. For example,

A. They may increase male interest in a woman
B. They may decrease female interest in a man
C. They may decrease frequency of sexual intercourse
D. They may decrease male interest in women

Answer: A
Page 177

38.The first step in sensory perception is signal transduction. In visual perception, light from the outside world is transduced by _____, which contain rhodopsin. In auditory perception, pressure is transduced in the cochlea by _____.

A. Rods/cones; hair cells
B. Ganglion cells; hair cells
C. Rods/cones; tympanic membrane
D. Ganglion cells; tympanic membrane

Answer: A

Pages 139, 168

39.Hypnosis has several therapeutic applications, including relief of pain. One technique for pain relief is known as **glove anesthesia**. Which of these best represents **glove anesthesia**?

A. The hypnotist implants a post-hypnotic suggestion linking a particular piece of clothing, often a surgical glove, to reduced pain. When the patient's pain becomes extreme, it can be lessened simply by the act of wearing the glove.
B. The hypnotist suggests that the patient's hand is anesthetized, then asks the patient to touch the painful area with the anesthetized hand. This transfers the pain relief to the affected area.
C. Hypnosis is used as part of boxing training, enabling the boxer to withstand more pain in the ring (while wearing boxing gloves) than he would otherwise be able to tolerate.
D. The hypnotist wears a distinctive pair of gloves, and suggests to the patient that the gloves allow him to cure pain. Because the patient is operating under trance logic, he believes the gloves have healing properties, and is relieved of pain.

Answer: B
Page Ref: 213-214

40.One commonly observed effect of drinking is *alcohol myopia*. Which best describes what researchers mean when they use this phrase?

A. The blurring of vision caused by excessive drinking
B. The tendency to find members of the appropriate sex more physically attractive than they might seem under sober conditions
C. The tendency to allow superficial observations to have a disproportionate impact on behavior, without allowing time for more abstract, reflective thought.
D. The overestimation of your own abilities to perform tasks requiring hand-eye coordination (e.g., driving)

Answer: C
Page Ref: 222

41.A common effect of consuming relatively small amounts of alcohol is to make people more sociable. What drug category does alcohol fall into, and what might explain that effect?

A. depressant; alcohol first inhibits our existing social inhibitions, so it works as a net dis-inhibitor
B. stimulant; alcohol causes release of norepinephrine which acts as an alerting agent
C. stimulant; alcohol causes release of dopamine, which causes social interaction to be more rewarding
D. depressant; alcohol causes release of dopamine, which causes social interaction to be more rewarding

Answer: A
Page Ref: 220-221

42.One important structure involved in the regulation of human circadian rhythms is the _____, located in close proximity to the _____.

A. Frontal eye fields; optic chiasm
B. Frontal eye fields; parietal lobe
C. suprachiasmatic nucleus; parietal lobe
D. suprachiasmatic nucleus; optic chiasm

Answer: D
Page Ref: 204

43. Which best characterizes the proportion of sleep in a night? Which best characterizes the proportion of sleep over a lifetime?

A. More REM sleep earlier in a night than later; more REM sleep in old age than in infancy

B. More REM sleep later in a night than earlier; more REM sleep in infancy than old age

C. More REM sleep earlier in a night than later; more REM sleep in infancy than in old age

D. More REM sleep later in a night than earlier; more REM sleep in old age than infancy.

Answer: B
Page Ref: 195

44.Which of the following is *not* a commonly held hypothesis explaining our need to sleep?

A. We sleep in order to restore our body after a hard day.

B. We sleep in order to consolidate material that we've learned

C. We sleep because our ancestors were at risk for being eaten at night, and sleeping kept us from encounters with predators at night

D. We sleep in order to secrete melatonin

Answer: D
Page ref: 199

45.Imagine that you flinch after seeing lightning because in previous instances the lightning is followed by thunder, which scared you. In this scenario, lightning can be interpreted as being a(n):

46.A. unconditioned stimulus

47.B. unconditioned response

48.C. conditioned stimulus

49.D. conditioned response

50.Answer: C

51.Page 236 - 237

52.

53.

54.Reinforcement that is given for a response emitted after each hour and half (e.g., 10 a.m., 11:30 a.m., 1 p.m.) in

55.time is most likely to be a _____ schedule

56.A. variable ratio

57.B. variable interval

58.C. fixed interval

59.D. fixed ratio

60.Answer: C

61.Page 261

62.

63.

64. Carolyn desperately wants to lose weight, but finds it so difficult to resist the temptation of snack foods. Her difficulty in losing weight probably stems from the powerful effects of _____.

65.A. shaping

66.B. discrimination

67.C. delayed reinforcement

68.D. immediate reinforcement

69.Answer: D

70.Page 258

71.

72.

73. Secondary reinforcers differ from primary reinforcers in that secondary reinforcers _____.

74.A. aren't as effective

75.B. can potentially reinforce or punish behavior

76.C. do not inherently satisfy physical needs

77.D. only pertain to intangible objects or events, such as praise

78.Answer: C

79.Page 257

80.

81.

82. All of the following illustrate positive punishment EXCEPT:

83.A. Receiving harsh criticism for lying to your parents.

84.B. Losing telephone privileges for breaking curfew.

85.C. Getting stung by a bee when walking barefoot outside and stepping on the bee.

86.D. Getting pepper sprayed for making a lewd comment to a stranger.

87.Answer: B

88.Page 255

89.

90.

91. In which phases of classical conditioning is the conditioned stimulus presented in isolation?

92.A. extinction

93.B. acquisition

94.C. rest period

95.D. A and B

96.Answer: A

97.Page 240

98.

99.

100.

Short Answer Questions
(Answer 5 of the following 10 questions)

1) For each blank below, did the finding occur in: **both men and women**, **men** only, or **women** only?

In a brain imaging study of empathy, men and women played a financial game with two partners, a fair player and an unfair player. _____ showed activation in the insula when they received pain, and also when they saw the fair player receive pain. _____ showed insula activation when the unfair player received pain. _____ showed nucleus accumbens activation when the unfair player received pain. _____ reported a stronger desire for revenge against the unfair player.

Answers: Both, Women, Men, Men

2) Name the type of validity described by each of the following:

A. The design and procedure appear to assess the variables of interest.

Face validity

B. The measures or procedure of a study are comparable to a different valid measure or procedure.

Criterion validity

C. The measures of a study assess all aspects of a phenomenon of interest.
Content validity

D. The measures of the study assess variables specified by a theory
Construct validity

3) Please read the scenario below and answer each of the following questions. Several researchers want to study the effect of exercise on visual perception. Each decides to use a different method in their study. Researcher A assigns participants to one of two groups, exercising for 10 or 0 minutes, and then records their performance on a task designed to measure visual acuity. Researcher B decides to use the same task to measure visual acuity performance from professional athletes vs. college students who do not play a sport. Researcher C asks a sample of students from a university to report the number of hours per week they exercise, then looks at the relationship between this measure and their performance on the same visual acuity task.

Name the kind of method used by each researcher:

A. _____
experimental design

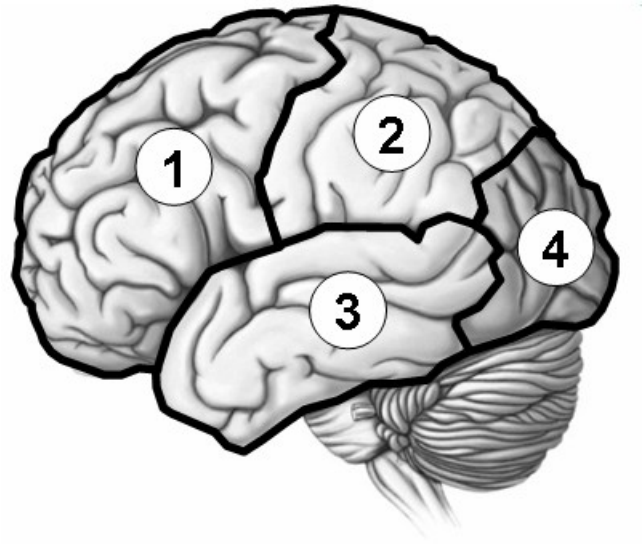
B. _____
quasi-experimental design

C. _____
correlational study

D. Which experimenter (A, B, or C) can make the strongest claim about whether exercise is causally responsible for a difference on the visual perception task? _____

Answer: Researcher A

4) Identify the four principal lobes of the human cerebrum shown in this image:



1_____
2_____
3_____
4_____

1. Frontal
2. Parietal
3. Temporal
4. Occipital

(p92)

5) Match each of the following mental faculties and behavior to the appropriate cerebral lobe above (question 4):

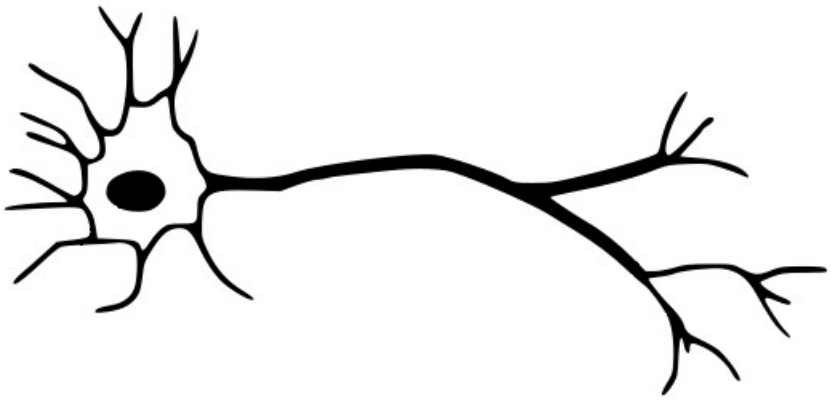
a. Motor planning and movement
b. Primary Vision
c. Primary Hearing
d. Spatial processing and sense of touch.

(A. Frontal, (B. Occipital, (C. Temporal, (D. Parietal

(pp94-96)

6) In the cartoon of a neuron below:

a. Identify the dendrites
b. Identify the axon
c. Indicate where neurotransmitters are released
d. Draw an arrow indicating the direction of the action potential (the direction of information processing in the cell).



From left to right: Dendrites, Axon, →, Neurotransmitter release
(p81)

7) Name the four explanations for dreaming presented in the textbook, and provide a one-sentence explanation of each:

Answers:
Freud – wish fulfillment
Activation-synthesis
Editing/Strengthening neural connections
Goals/Desires and Arousal/Inhibition
Page Ref: 200-202

8) What are 3 psychological, physiological, or behavioral signatures of the following stages of sleep? (3 per sleep stage)

REM: _____

Stage1: _____

Stage2: _____

Stage3&4: _____

Page Ref: 193-195

9) Over time, heroin users report needing more and more heroin to get the same high. This is an example of _____. When the user stops taking heroin, he/she will likely develop seriously uncomfortable side effects, known as _____. These are particularly bad with heroin, as heroin is in the _____ class of drugs, which bind to the same receptors that endorphins bind to. More generally, heroin is known as

a _____, which is a broader class of drugs that dulls the senses and relieves pain. (Choose a different answer for the third and fourth blank)

Answers:

1) **tolerance**
2) **withdrawal symptoms**
3) **opiate**
4) **narcotic analgesic**

Page Ref: 219, 226

10) Garcia and Koelling noticed that some rats developed taste aversion to drinking water. According to them the unconditioned stimulus was _____ and the conditioned stimulus was _____. However, they also found that when they paired a shock with bright lights and noise and tasteless water, rats avoided the water paired with the light and noise but not the water that had a sweet taste. They could only get the rats to avoid the sweet tasting water when they were given radiation. This indicates that taste aversion could be conditioned to a _____ stimulus, but not to a _____ stimulus.

Radiation, taste of water from plastic bottle, gustatory, visual/auditory. page 246-247.

11) Shocking a rat or giving a student a bad grade is an example of _____. Not allowing a child to watch TV after getting a bad grade is an example of _____. The child then comes home from school with a good grade and the parent gives the child a cookie. This is an example of _____. Negative reinforcement occurs when _____.

Positive punishment, negative punishment, positive reinforcement, the removal of something unpleasant to reward behavior.

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9.00SC Introduction to Psychology
Fall 2011

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9.00 - MEMORY

Professor John Gabrieli

The *Fragile* Power of Memory

WHY DO WE REMEMBER WHAT WE EXPERIENCE?

WHY DO WE FORGET WHAT WE EXPERIENCE?

IS MEMORY LIKE A CAMERA OR LIKE A PUNCH BOWL ?

BOTTOM-UP & TOP-DOWN INFLUENCES ON MEMORY

- Bottom-Up

 perceptual experience

 what we see and hear

- Top-Down

 prior knowledge, concepts, expectations, subsequent experience

and which grows over time?

The Three-Stage Model of Memory

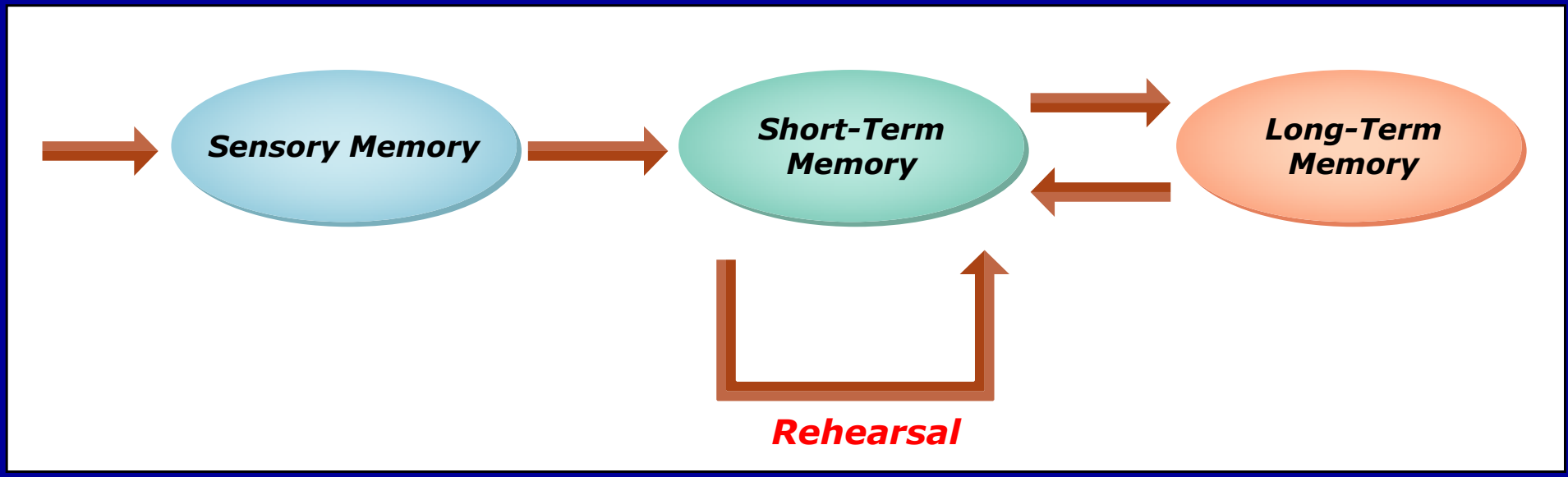


Image by MIT OpenCourseWare.

What letters do you see?

A Q Z R

T P W L

B Y S D

A Q Z R

T P W L

B Y S D

(whole-report)

What letters do you see?

H B S T

A H M G

E L W C

middle row??

H B S T

A H M G

E L W C

(partial-report)

ATTENTION & SENSORY STORES

- 12 letter display

 whole-report condition

 37% correct (4 letters)

- 12 letter display -

 tone after display (high, medium, low

 partial-report condition

 76% correct (3 letters)

- Much is sensed, but attention selects only a little to be remembered

The Three-Stage Model of Memory

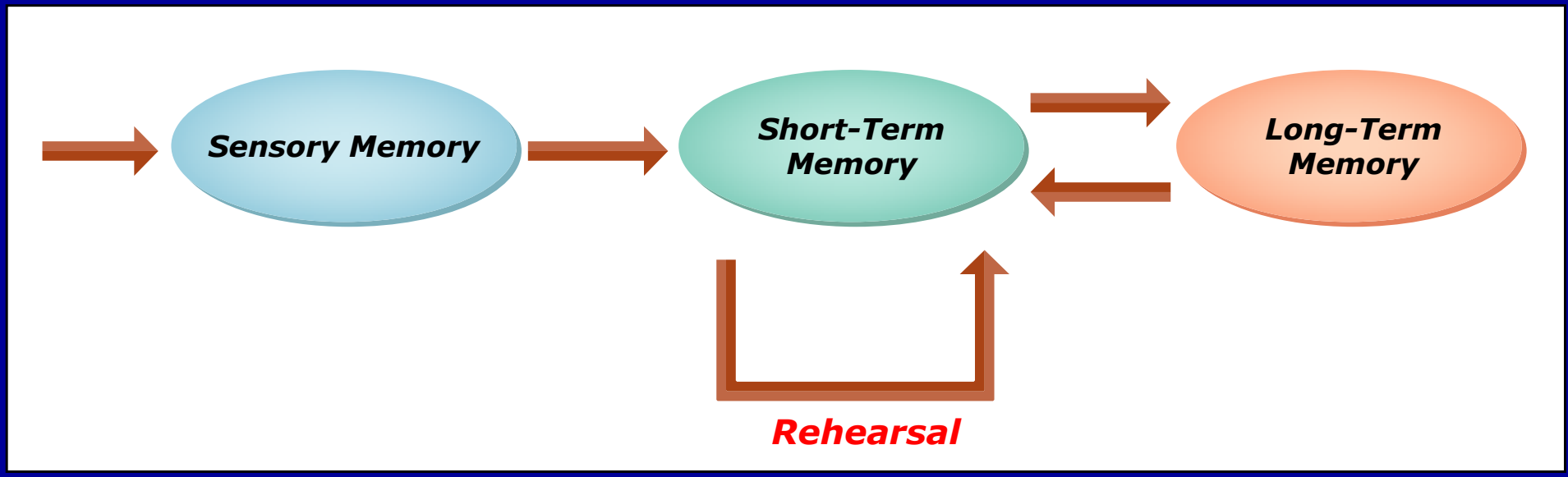


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SHORT-TERM MEMORY

- limited capacity
- 7+/-2 chunks

Test of Digit Span

Span of 4: 6 1 9 4

Span of 5: 3 7 8 5 2

Span of 6: 9 6 5 2 8 3

Span of 7: 4 2 6 9 8 5 1

Span of 8: 8 1 6 3 7 2 4 9

Span of 9: 6 2 5 7 3 4 9 8 1

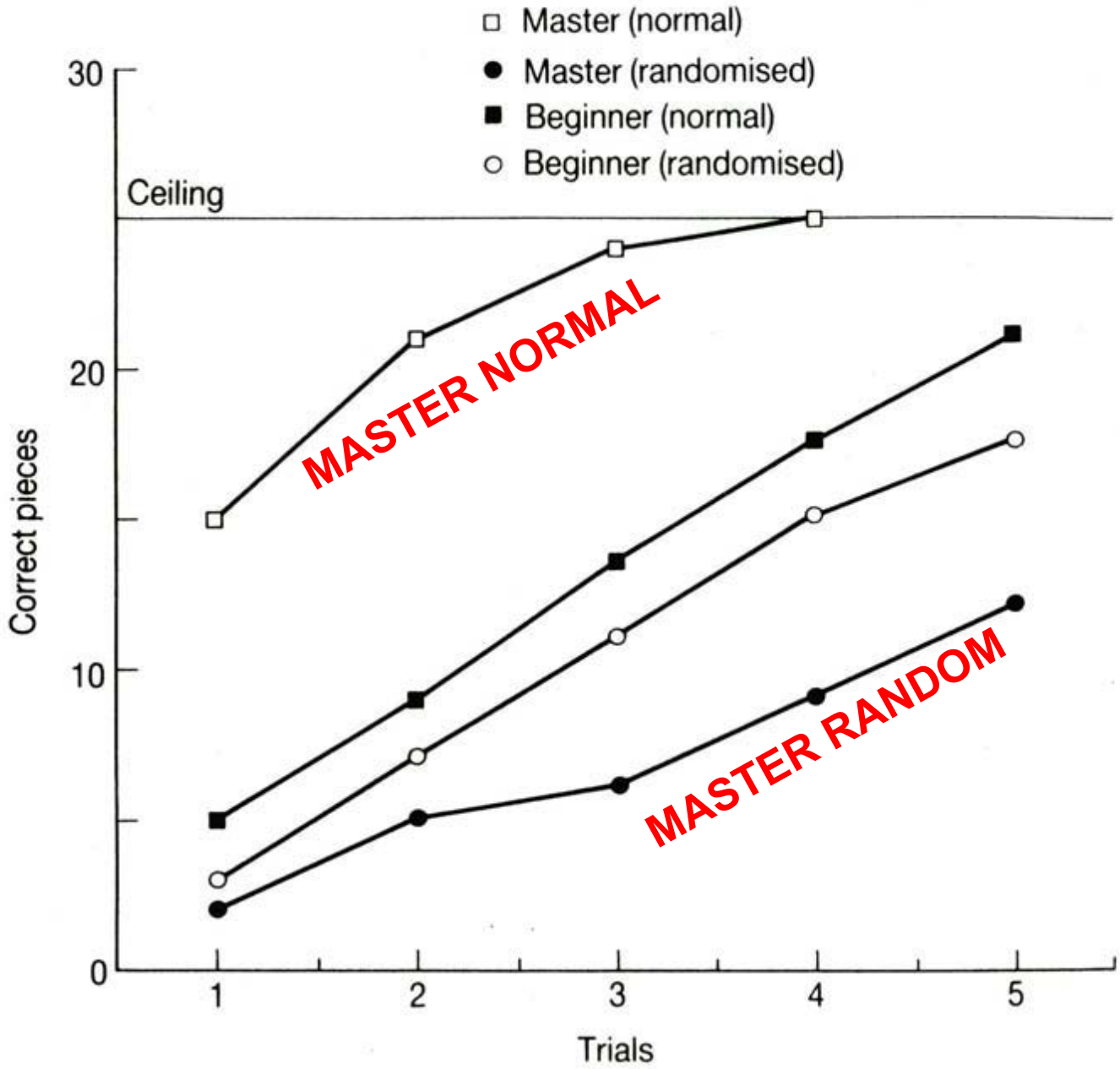
Span of 10: 9 3 8 2 4 7 1 5 3 6

Span of 11: 5 8 1 4 7 9 3 2 6 1 7

SHORT-TERM MEMORY

- limited capacity
- 7+/-2 chunks
- prior knowledge defines chunks, allows for more information to be retained in memory, may also miscode information

WHERE WERE THE CHESS PIECES?



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the value & price of knowledge

What letters do you see?

F
B
I
C
I
A
I
B
M
M
T
V

What letters do you see?

FBI CIA IBM MTV

F
B
I

C
I
A

I
B
M

M
T
V

FBI CIA IBM MTV

What letters do you see?

G D C E I A H B F

What letters do you see?

A B C D E F G H I

What words do you see?

LEAF PAPER SEAT TIRE CAR FISH ROCK WIRE WHEEL BEACH TREE BOY RADIO RULE

What words do you see?

WHILE I WAS WALKING THROUGH THE WOODS A RABBIT RAN ACROSS MY PATH

LEAF PAPER SEAT TIRE CAR FISH ROCK WIRE WHEEL BEACH TREE BOY RADIO RULE (13)

WHILE I WAS WALKING THROUGH THE WOODS A RABBIT RAN ACROSS MY PATH (13)

The Three-Stage Model of Memory

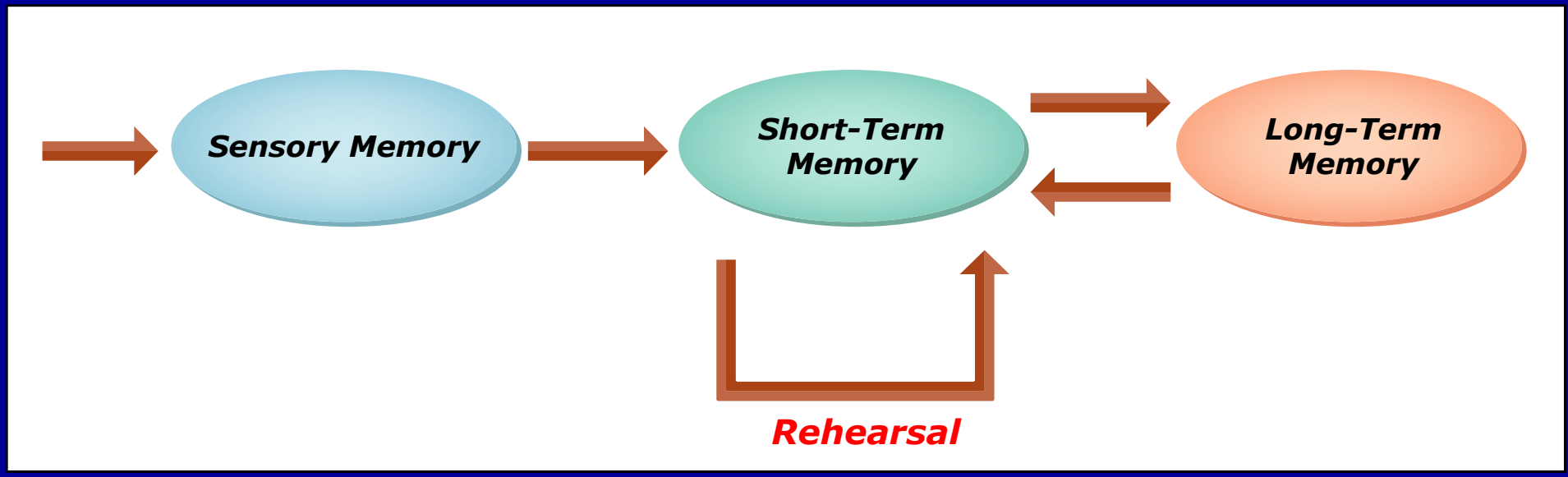


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LONG-TERM MEMORY or SECONDARY MEMORY

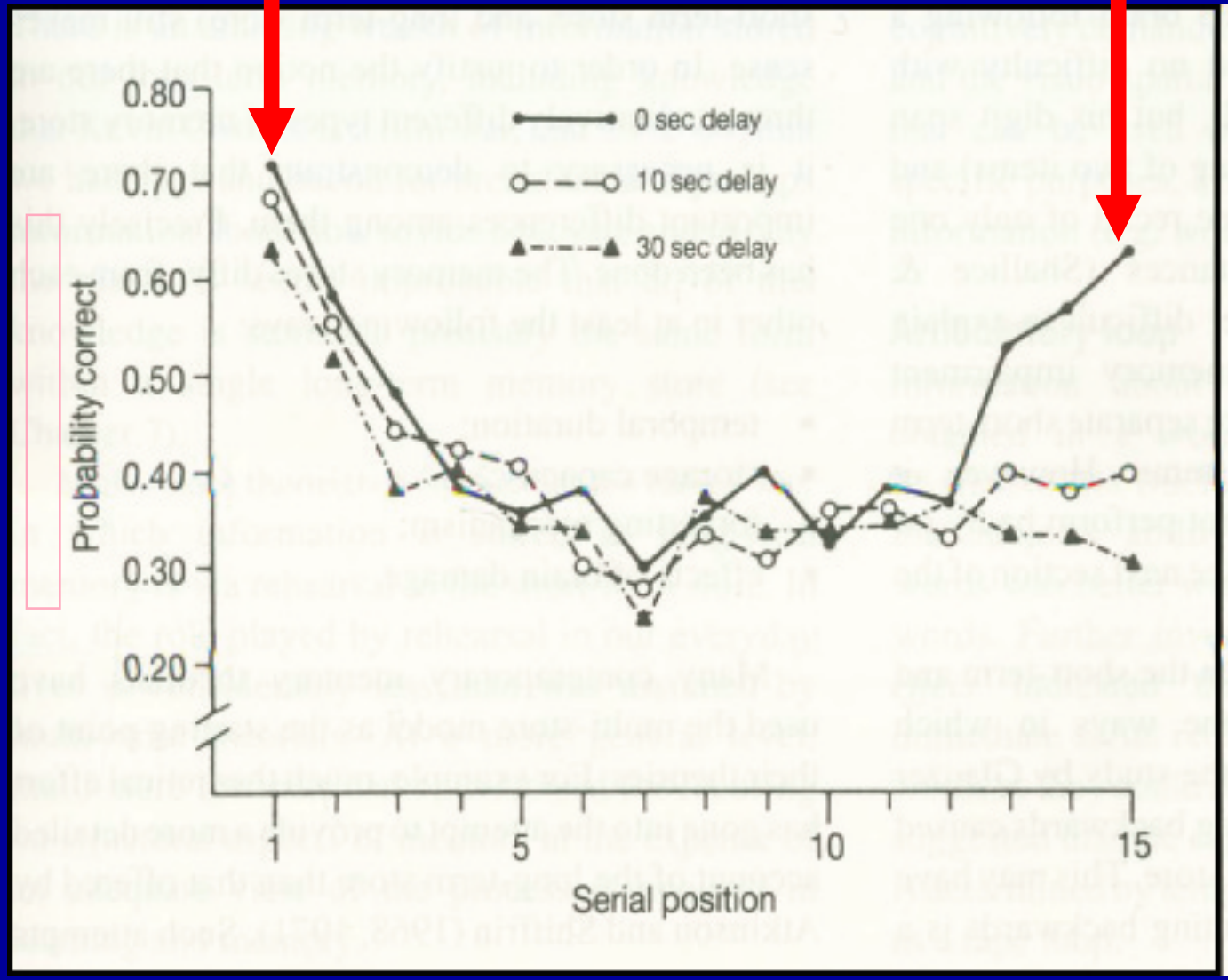
- serial position effect
 - primacy (LTM)
 - recency (STM)

- encoding and depth of processing
- organization
- encoding specificity
- passive forgetting vs. interference
- proactive interference
- retroactive interference
- memory for gist
- flashbulb memories
- false memories

Memory Test

1. Mailbox
2. Sardine
3. Shotgun
4. Peacock
5. Credit
6. Detail
7. Flicker
8. Airline
9. Spinach
10. Clarinet

Primacy Effect = LTM Recency Effect = STM



Free recall as a function of serial position and duration of the interpolated task.

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Ebbinghaus' Curve of Forgetting

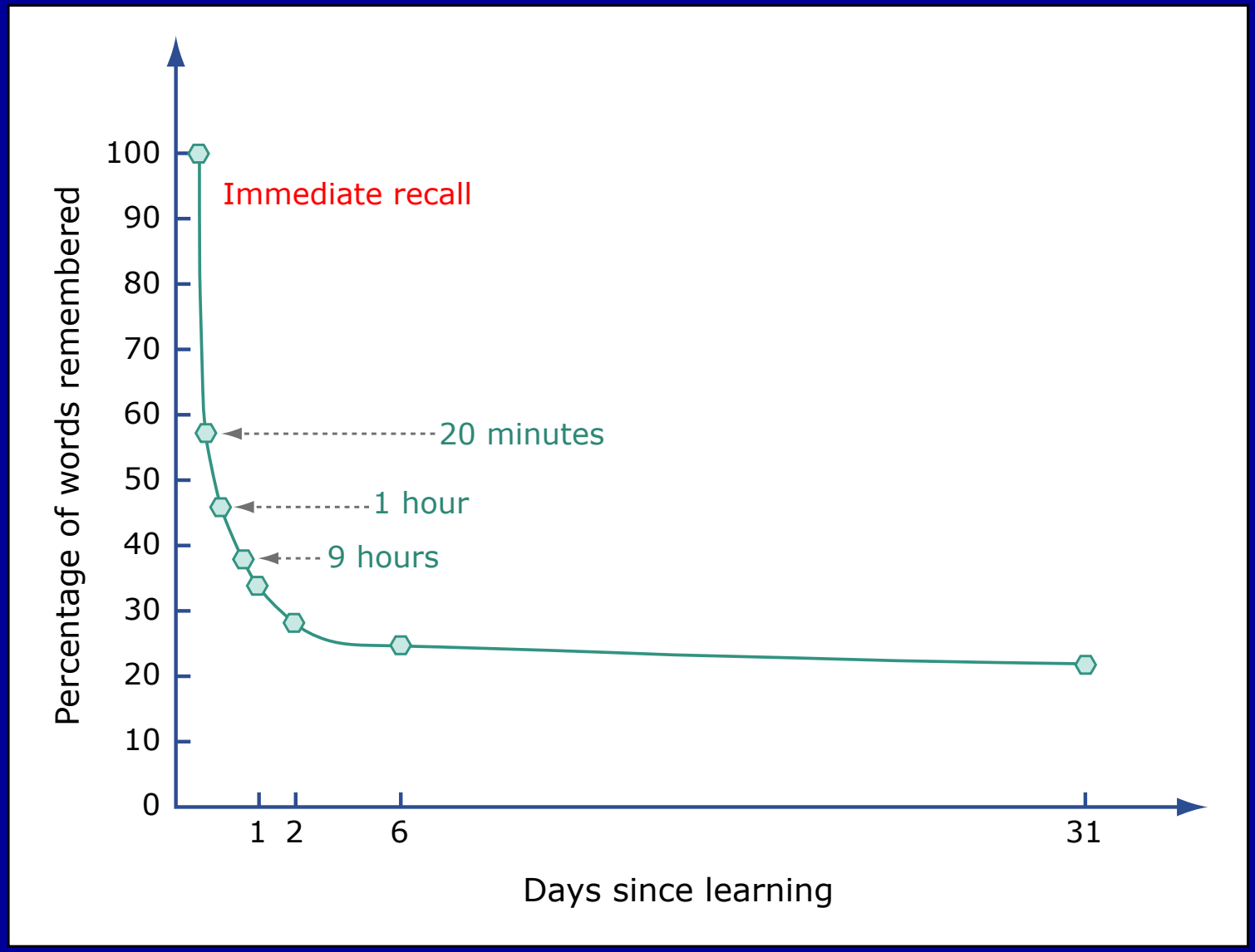


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If word is in CAPITAL LETTERS,
Tap left hand

If word is in lower case letters,
Tap right hand

zebra
CAR
TABLE
mosquito
MONKEY
train
DESK
termite
BUS
wasp
camel
SOFA

WHAT WERE THE WORDS?

If word names a LIVING thing,
Tap left hand

If word names a non-living thing,
Tap right hand

SPIDER
chair
FOX
TRUCK
lamp
BEE
tiger
boat
RABBIT
tractor
bed
BUTTERFLY

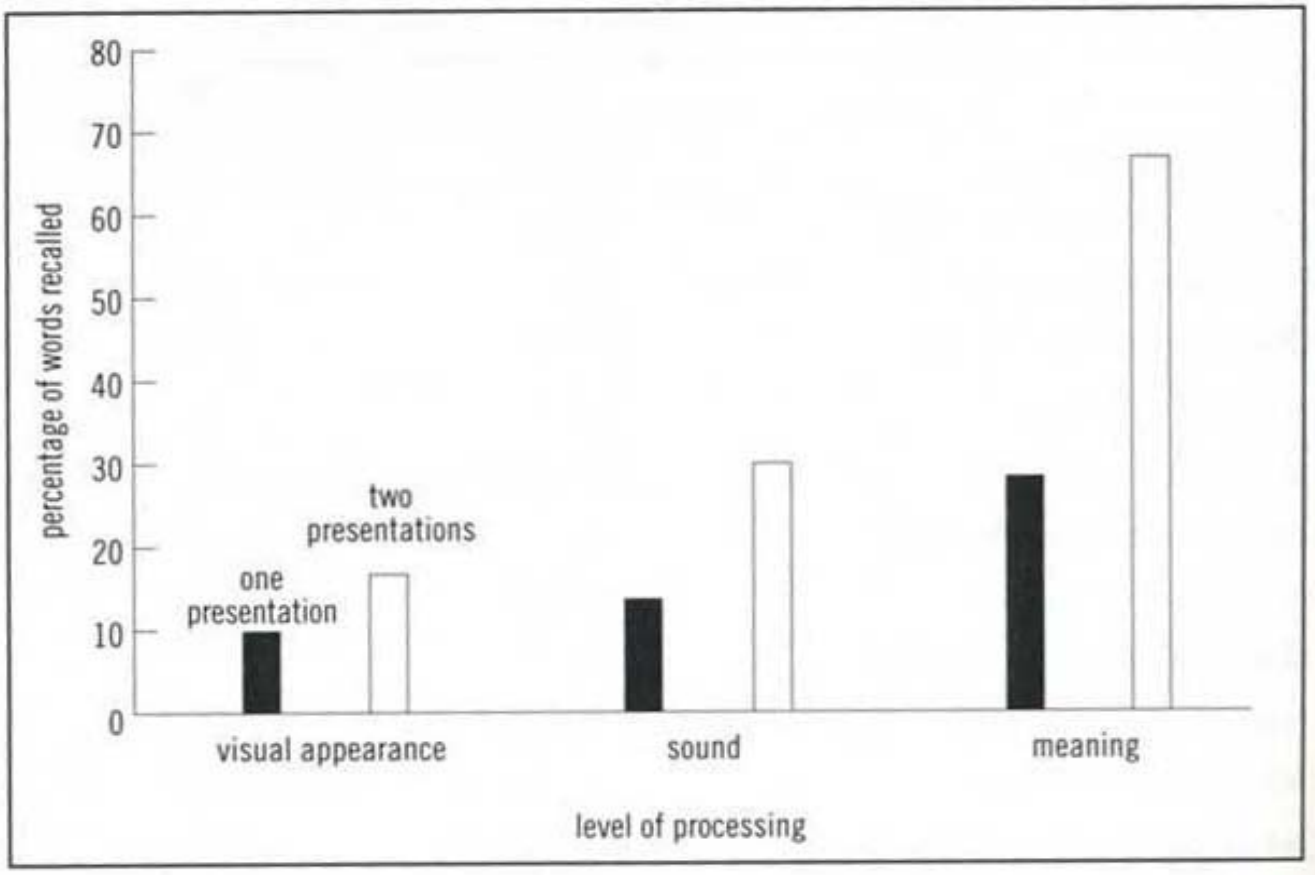
WHAT WERE THE WORDS?

zebra
CAR
TABLE
mosquito
MONKEY
train
DESK
termite
BUS
wasp
camel
SOFA

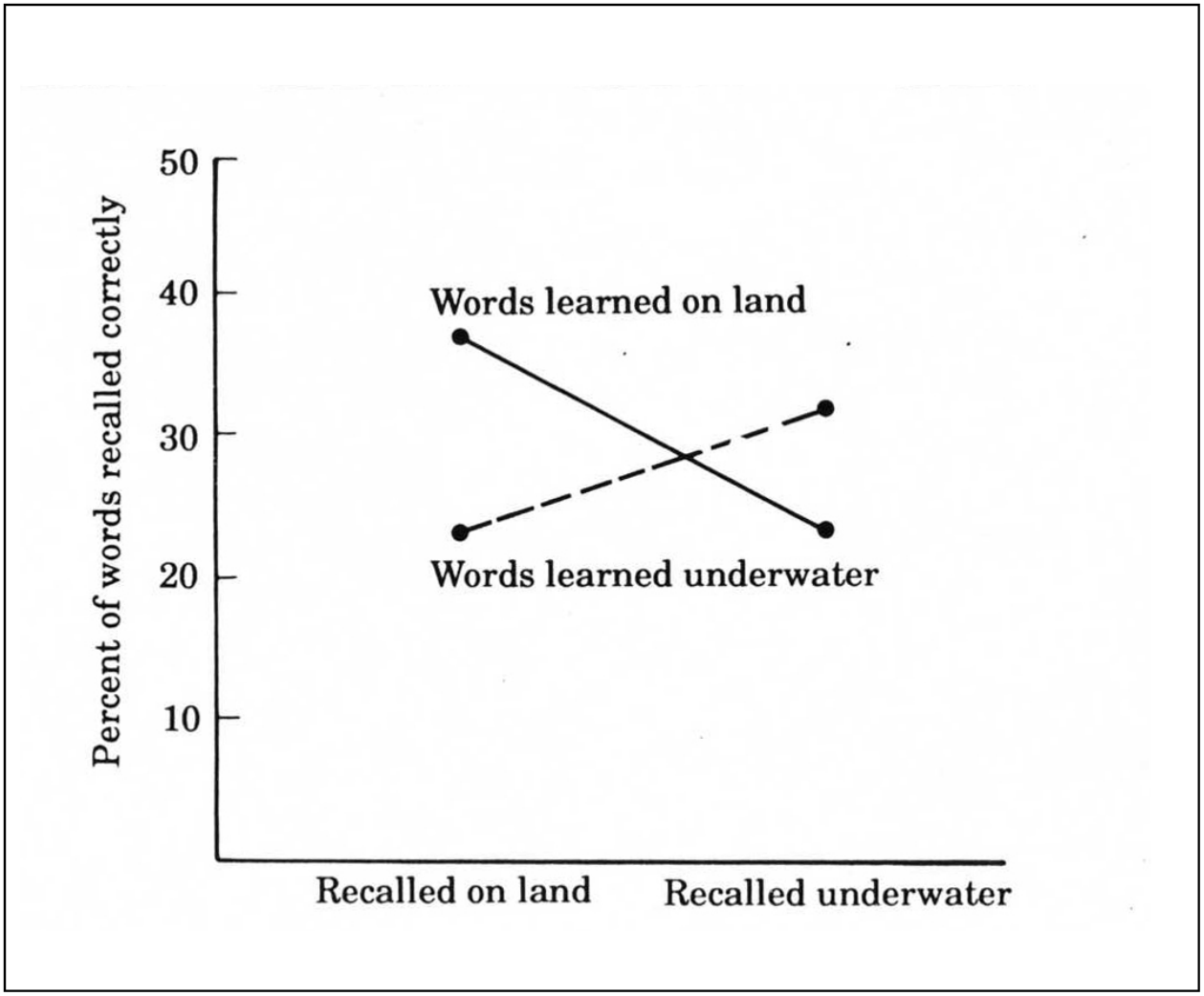
SPIDER
chair
FOX
TRUCK
lamp
BEE
tiger
boat
RABBIT
tractor
bed
BUTTERFLY

Appearance
Shallow Encoding
Poor Memory

Meaning
Deep Encoding
Good Memory



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The effect of context on recall of word lists. Words learned underwater are best recalled underwater, and vice versa. (From Godden and Baddeley, 1975)

SERVE

EDUCATE

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CAREER	VACUUM	WRITER	ELECTRICIAN	TEACHER	COOK
DUST	DESIGNED	SCRUB	HOUSEWORK	CARPENTER	ENTERTAIN
PHYSICIAN	HOME	PLUMBER	ARTIST	RESPONSIBILITES	CHILD CARE
SKILLED	PURCHASE	CREATIVE	BATHE	FOOD	PROFESSIONAL

RESPONSIBILITIES

CAREER			HOME		
PROFESSIONAL	SKILLED	CREATIVE	HOUSEWORK	CHILD CARE	FOOD
LAWYER	PLUMBER	WRITER	VACUUM	BATHE	PURCHASE
PHYSICIAN	ELECTRICIAN	ARTIST	DUST	EDUCATE	COOK
TEACHER	CARPENTER	DESIGNER	SCRUB	ENTERTAIN	SERVE

Memory better after semantically organized display than after random display

Ebbinghaus' Curve of Forgetting

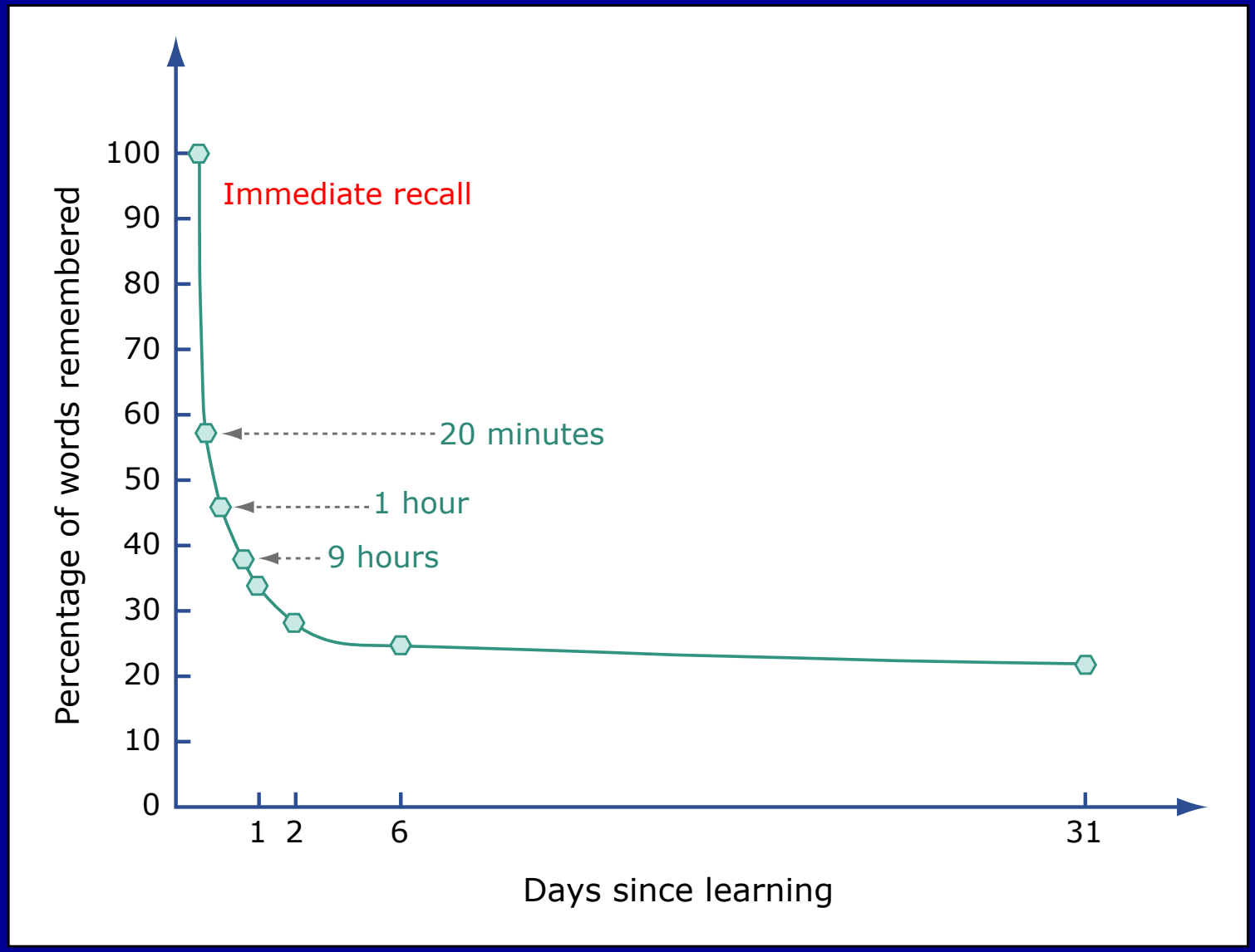


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WHY DO WE FORGET?

passive forgetting?

or

interference?

Proactive and Retroactive Interference

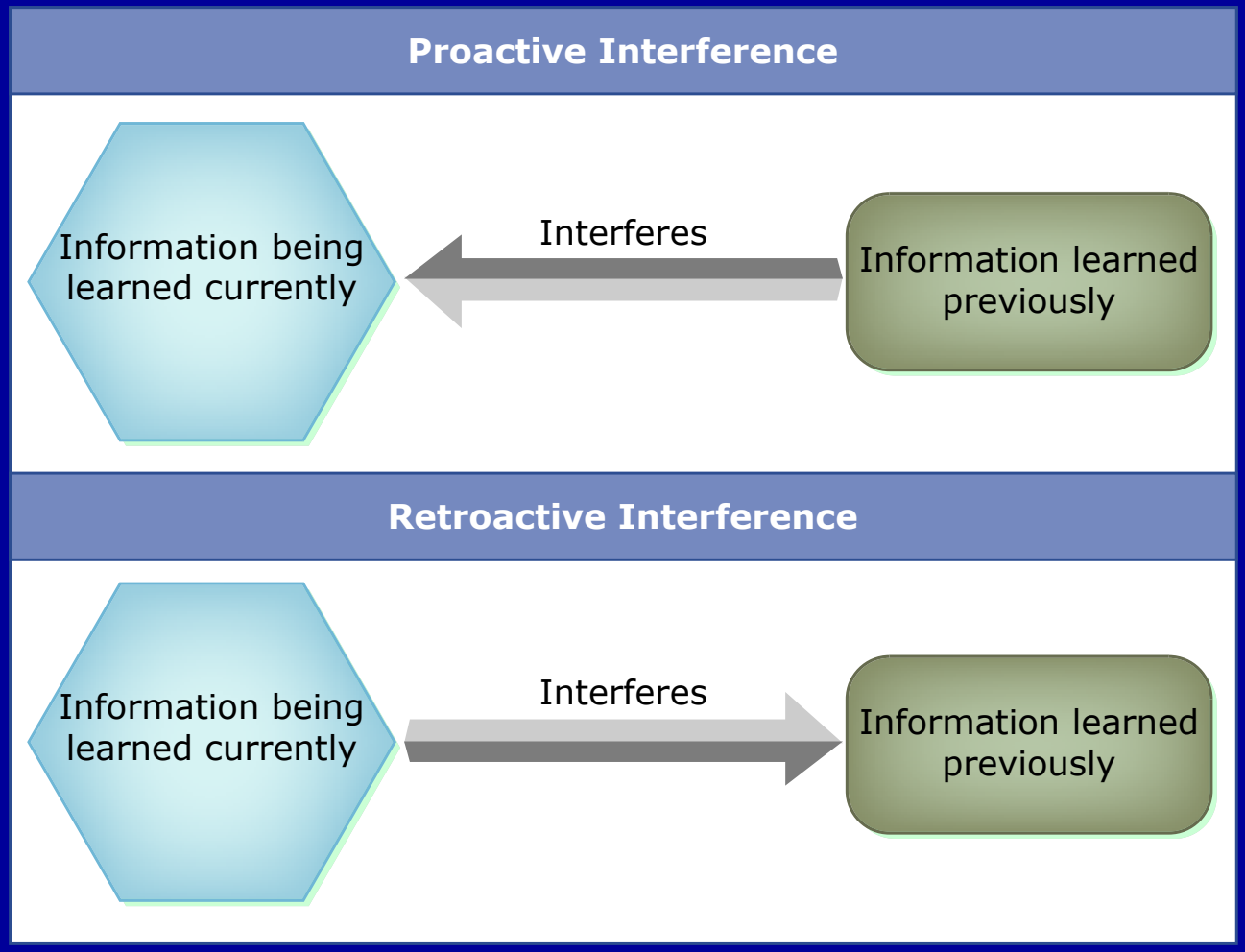
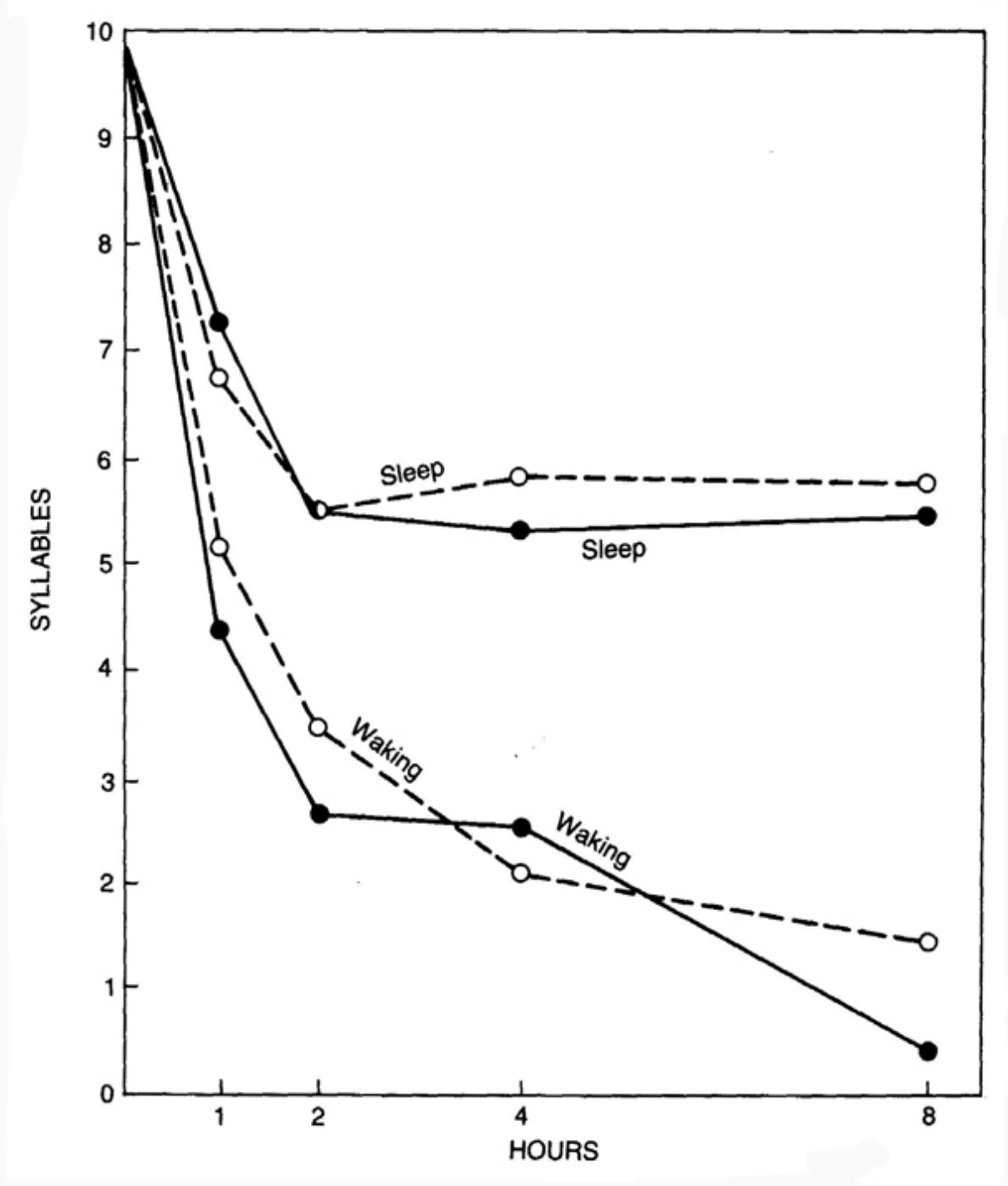


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Retroactive Interference

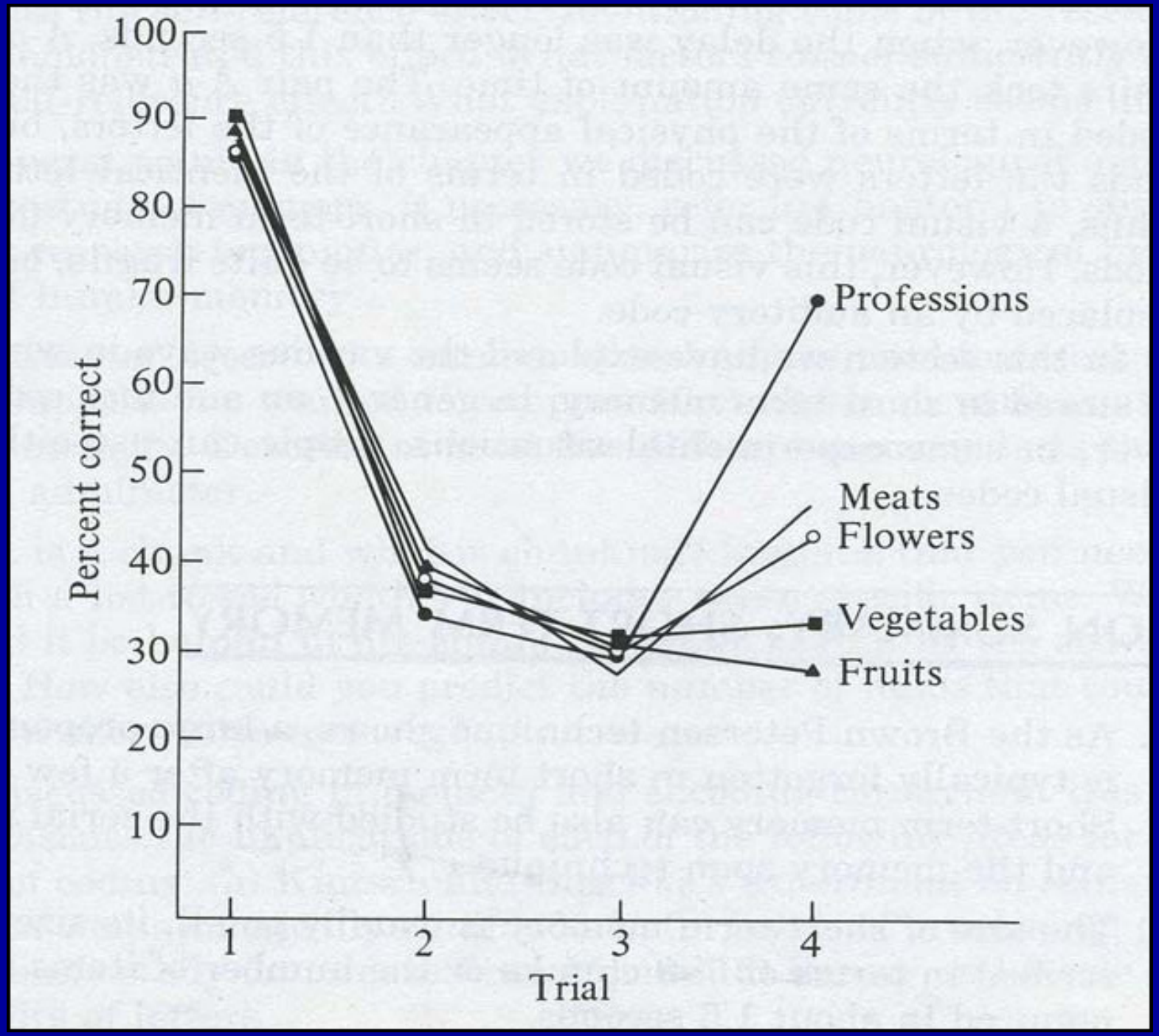
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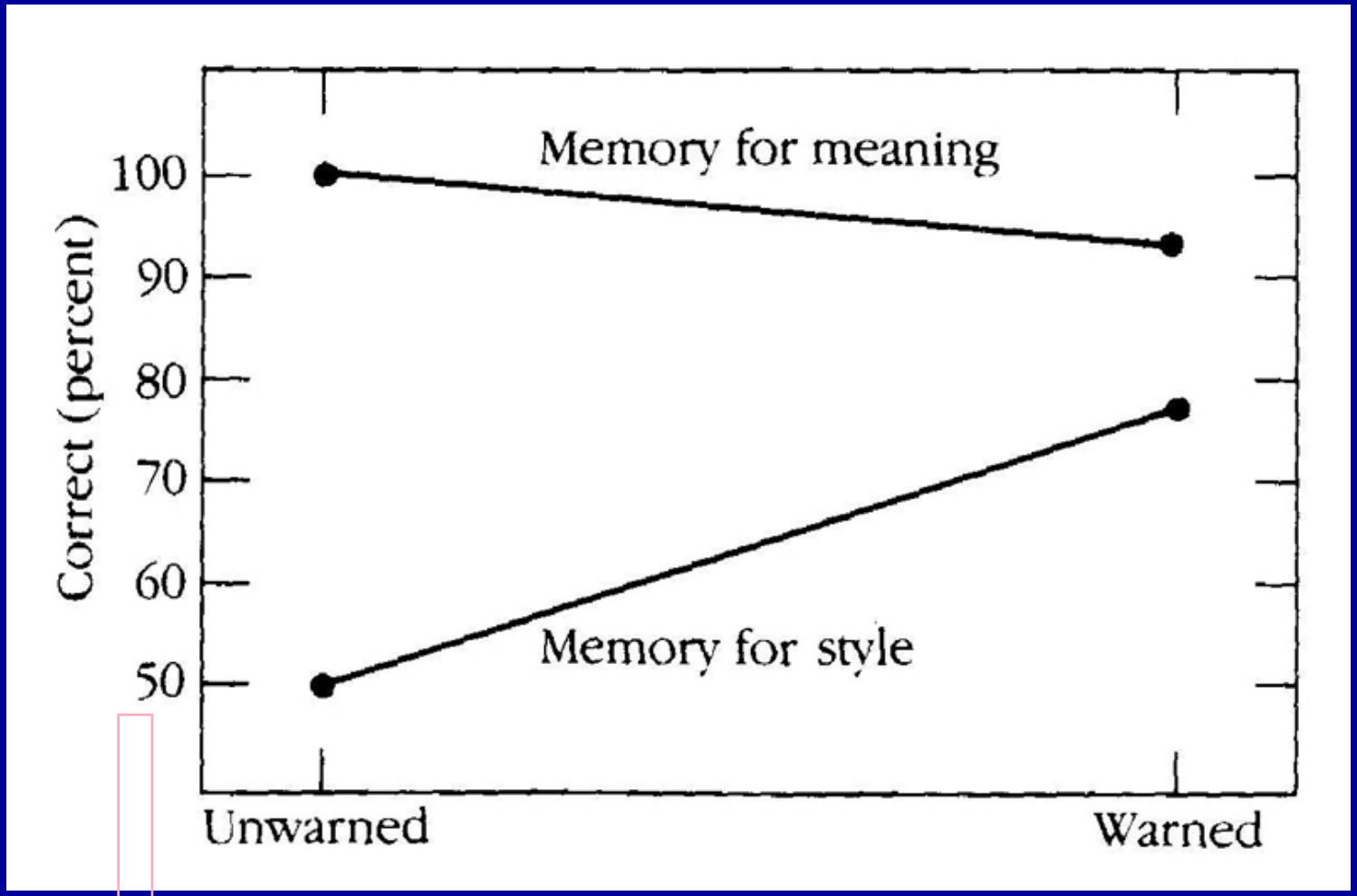
The classic Jenkins & Dallenbach (1924) result, showing higher recall of nonsense syllables for two subjects who slept after acquisition versus remaining awake after acquisition.

PI (18 sec)

banana	138	
peach		
apple		
plum		245
apricot		
lime		
melon		97
lemon		
grape		
orange	189	
cherry		
pineapple		
doctor		177
teacher		
lawyer		



Source: Wickens, D. D., et al. "Multiple Encoding of Word Attributes in Memory." *Memory & Cognition* 4, no. 3 (1976): 307-10. © Springer Science+Business Media. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.



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Ability of warned versus unwarned subjects to remember a wording difference that affected meaning versus style. (Adapted from Wanner, 1968)

door

glass

pane

shade

ledge

sill

house

open

curtain

frame

view

breeze

sash

screen

shutter

window

IS MEMORY LIKE A CAMERA OR LIKE A PUNCH BOWL ?

BOTTOM-UP & TOP-DOWN INFLUENCES ON MEMORY

- Bottom-Up

 perceptual experience

 what we see and hear

- Top-Down

 prior knowledge, concepts, expectations, subsequent experience

and which grows over time?

THE MIND OF A MNEMONIST

(A Little Book About a Vast Memory)

- Mnemonist - S.
- A.R. Luria studied S for 30 years
- at 30, editor noticed that S. took no notes but had verbatim recall - sent S. to Luria

6	6	8	0
4	4	3	2
1	6	8	4
7	9	3	5
4	2	3	7
3	8	9	1
1	0	0	2
3	4	5	1
2	7	6	8
1	9	2	6
2	9	6	7
5	5	2	0
	0	1	

- studied for 3 minutes
- recall numbers in 40 sec
- same rate of recall months later
- faster left than right, down than up
- had to reinstate episode "see" room, "hear" voice
- errors were visual (3/8)
- could recall such lists 15 years later

imagery & synesthesia

- if S. heard noise while imaging he would see "puffs of steam" or "splashes" on the image
- converted auditory to visual experience, tones to colors
- could change resting pulse of 70-72 to 100 or 64, temperature of hand by 2 degrees
- problems in attending to message vs. voice, recognizing faces or voices in varied expression, abstract ideas, metaphors
- how to get rid of memories? write down and burn notes - active imaging of nothing

life & career

- professional mnemonist
- music school teacher
- vaudeville actor
- efficiency expert
- treated people with herbs, wife, son

FLASHBULB MEMORIES

- **Emotion important in determining what we remember - surprise & arousal**

 Kennedy assassination
 Challenger Disaster
 OJ Simpson verdict
 9/11 attack

 place
 ongoing activity
 source of news
 own feelings
 emotions in others
 aftermath

Studies that test right after and a year later:

- better remembered, but susceptible to distortion
- over-confident

Eyewitness Testimony

see slides

sports car/intersection/turns/hits pedestrian

YIELD SIGN or STOP SIGN

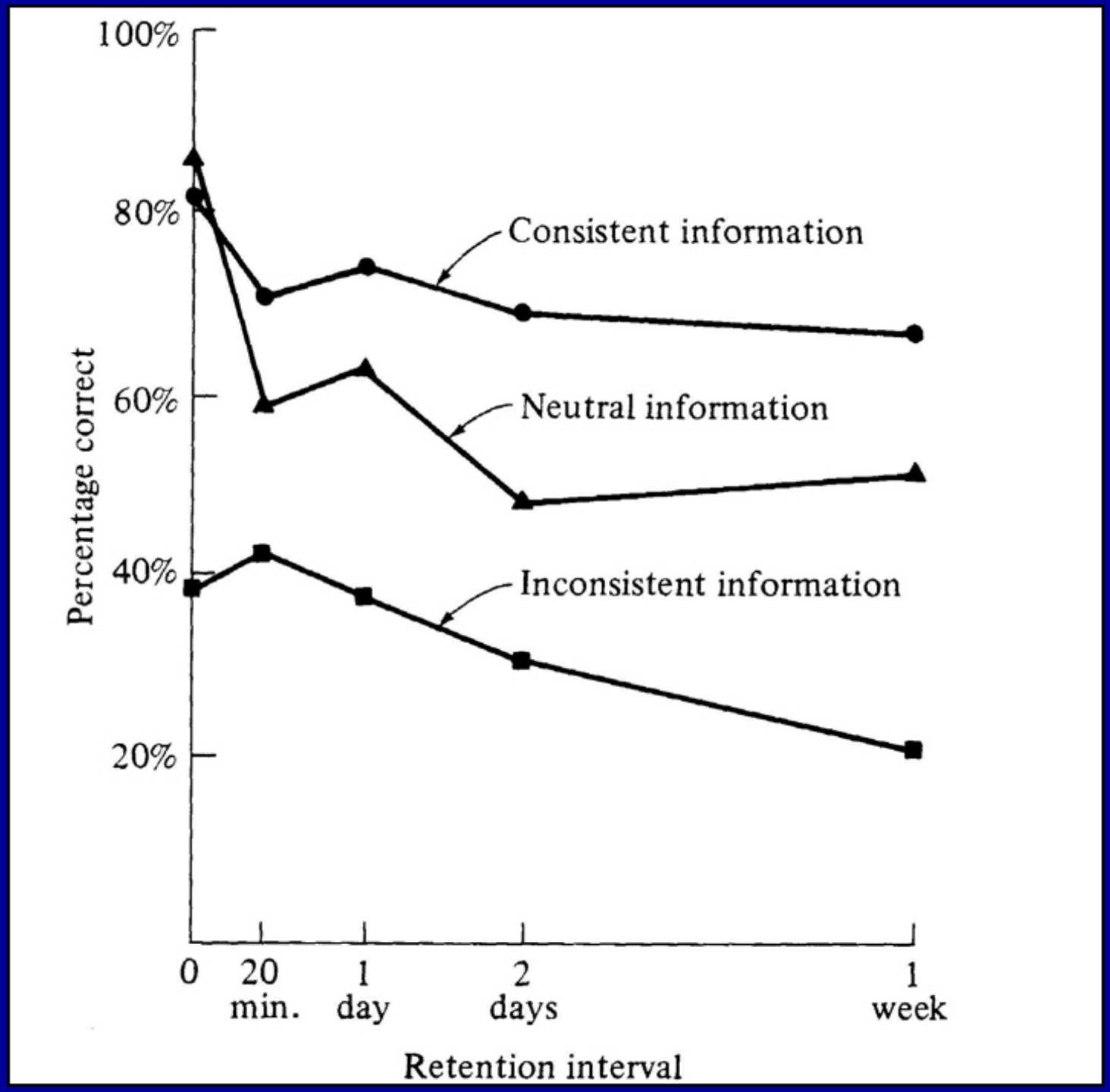
questions

"Did another car pass the red Datsun while it was stopped at the yield sign?" (consistent)

"Did another car pass the red Datsun while it was stopped at the stop sign?" (inconsistent)

"Did another car pass the red Datsun while it was stopped ?" (neutral)

Which slide did you see?



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Loftus study

Planting lost-at-mall memories

Jim, graduate student, "reminds" younger brother Chris of losing Chris in a mall when Chris was five, and an older, tallish man bringing him back.

Two days later, Chris says, "I was with you guys for a second and I think I went over to look at the toy store, the Kay-bee toy, and, uh, we got lost and I was looking around, and I thought, 'uh-oh. I'm in trouble now.' You know. And then I…I thought I was never going to see my family again. I was really scared, you know. And then this old man, I think he was wearing a blue flannel, came up to me…he was kind of old. He was kind of bald on top…he had a ring of grey hair…and he had glasses."

MEETING BUGS BUNNY AT DISNEYLAND

- 120 people see an ad for Bugs Bunny at Disneyland to evaluate ads (all had been there)

 meet? shake hand? - frequent (1/3) recall of Bugs Bunny during visit to Disneyland

dark October night

woman hitchhiker picked up on Pacific Highway South 10 miles outside of Seattle

man turns into isolated dirt road, rapes her, leaves her by the side of the road

24 hours later she looks at array of photos, picks Steven Titus - he is convicted

few months later, another man is arrested for a series of rapes - she sees picture and realizes this is the real rapist

Titus released - lost all his money, job, fiancee, reputation - 4 years pursuing a lawsuit - dies 11 days prior to trial of a heart attack - 10 months later his estate gets $2.8M

80,000 trials/year rely mainly on eyewitness testimony - of 1,000 wrong convictions, about half involved eyewitness errors

Woman at home in Australia.

Raped in her home.

Identifies Donald Thompson, a renowned Australian psychology who studies eyewitness memory biases.

Donald Thompson was on the TV live at the same time as the woman was raped. She had been watching the program.

September 22, 1969

- Susan Nason - 8 years old - missing and found murdered on October 31, 1969

November 1989

- Eileen Franklin remembers that her father murdered Susan Nason

November 30, 1990

- George Franklin found guilty

Courage to Heal - Ellen Bass & Laura Davis

"If you think you were abused and your life shows the symptoms, then you were.“

- Do you feel you have to control your emotions?
- Are you afraid of anger?
- Do you have blocks of your childhood that you can't remember? Do you have a sense that "something happened?"
- Do you have problems with alcohol, drugs, food, migraines, or back pain?

"When someone asks you, "Were you sexually abused as a child?" there are only two answers: One of them is "Yes," and one of them is "I don't know." You can't say "No."

- Roseanne on *"Oprah"*

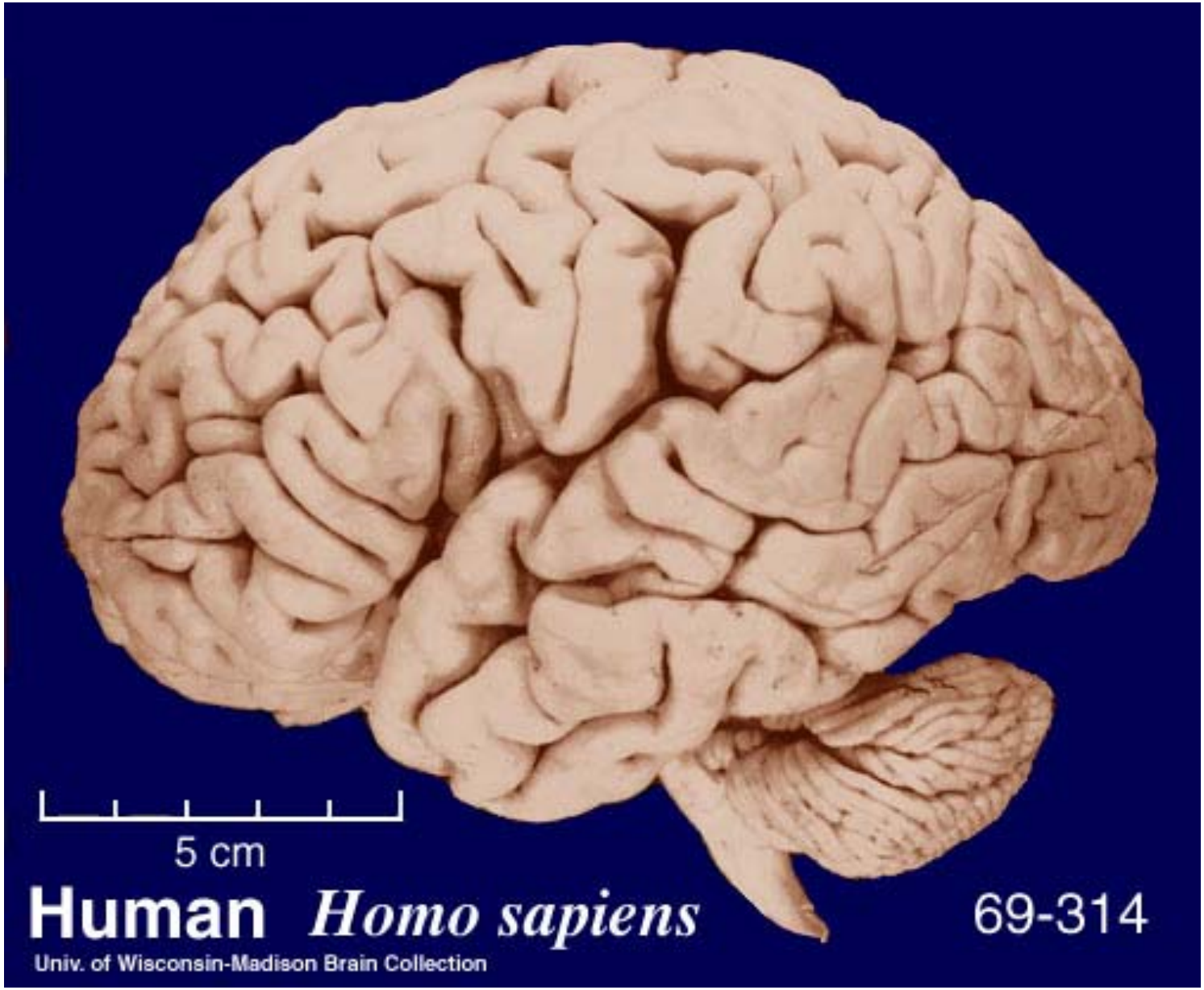
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9.00SC Introduction to Psychology
Fall 2011

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9.00 MEMORY II: AMNESIA & MEMORY SYSTEMS

Professor John Gabrieli



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MEMORY

- **Anterograde Amnesia**
- **Retrograde Amnesia**
- **Memory Systems**

Anterograde Amnesia

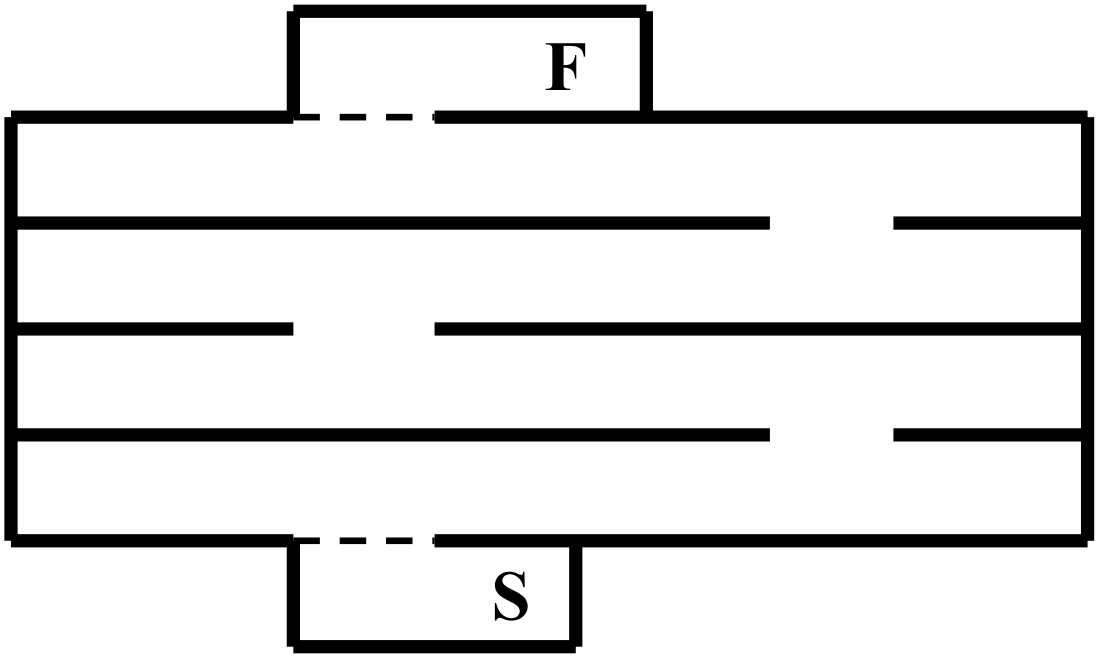
inability to remember new information such as events you experience or facts you encounter

Is memory in the brain *distributed* or *localized*???

"It is not possible to demonstrate the isolated localization of a memory trace anywhere in the nervous system…The engram is represented throughout the region"

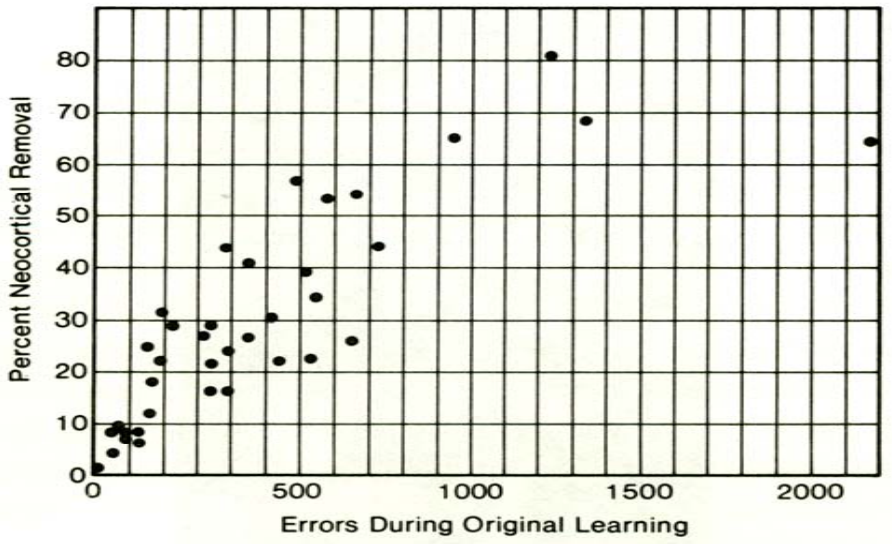
Karl Lashley 1950

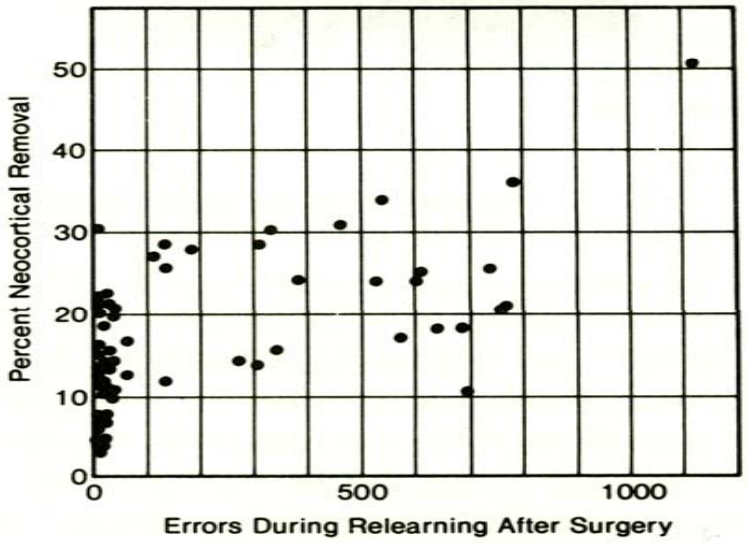
Maze



more cortical brain injury results in worse learning and memory regardless of lesion (injury) location

mass action for distributed memory





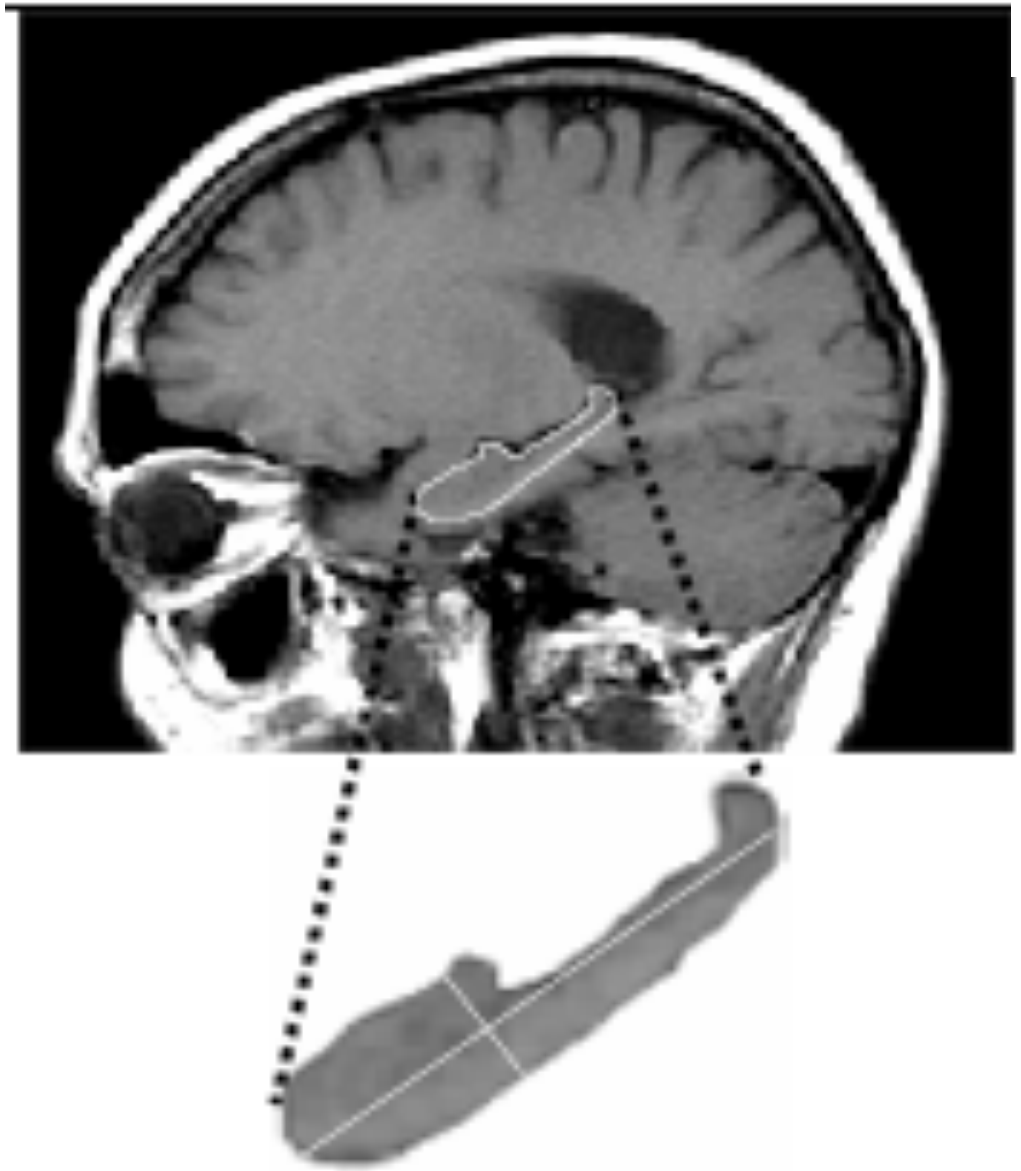
Relationship between extent of injury and errors in learning and relearning the Lashley III maze. Data from Lashley, K.S. "Brain mechanisms and intelligence: A quantitative study of injuries to the brain." University of Chicago Press, 1929.

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Source: Squire, L. *Memory and Brain*. Oxford University Press, 1987.

Location of hippocampus



Image: Public domain (NIH adaptation of Gray's Anatomy).



structural MRI

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THE AMNESIC PATIENT H.M.

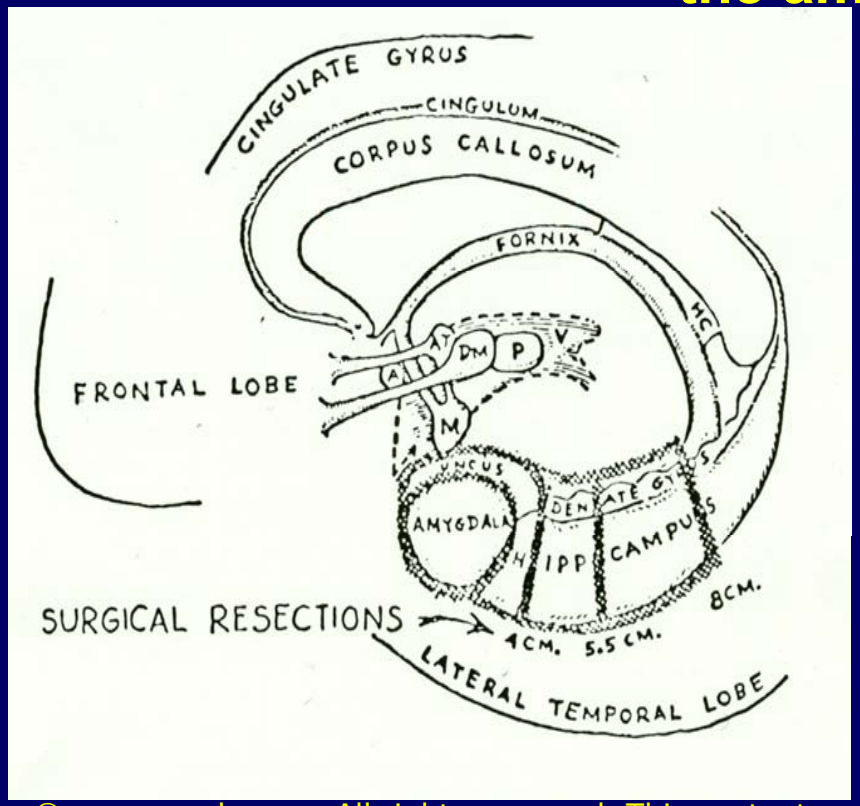
1926 Birth

1942 Age 16, First major seizure

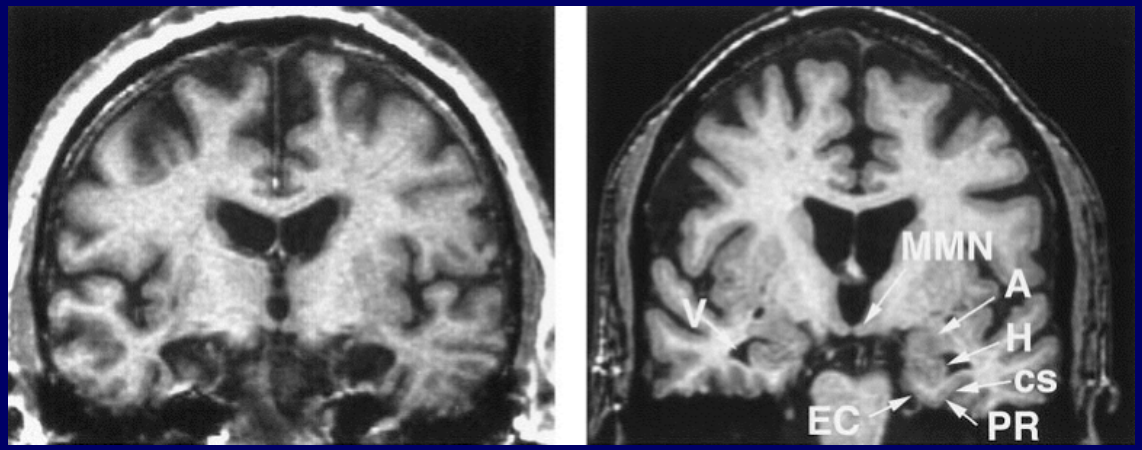
1953 Age 27, Bilateral medial temporal-lobe resection

1955 Report of pervasive and profound anterograde amnesia by Dr. Brenda Milner

1962 Neuropsychological examinations characterizing the amnesic syndrome



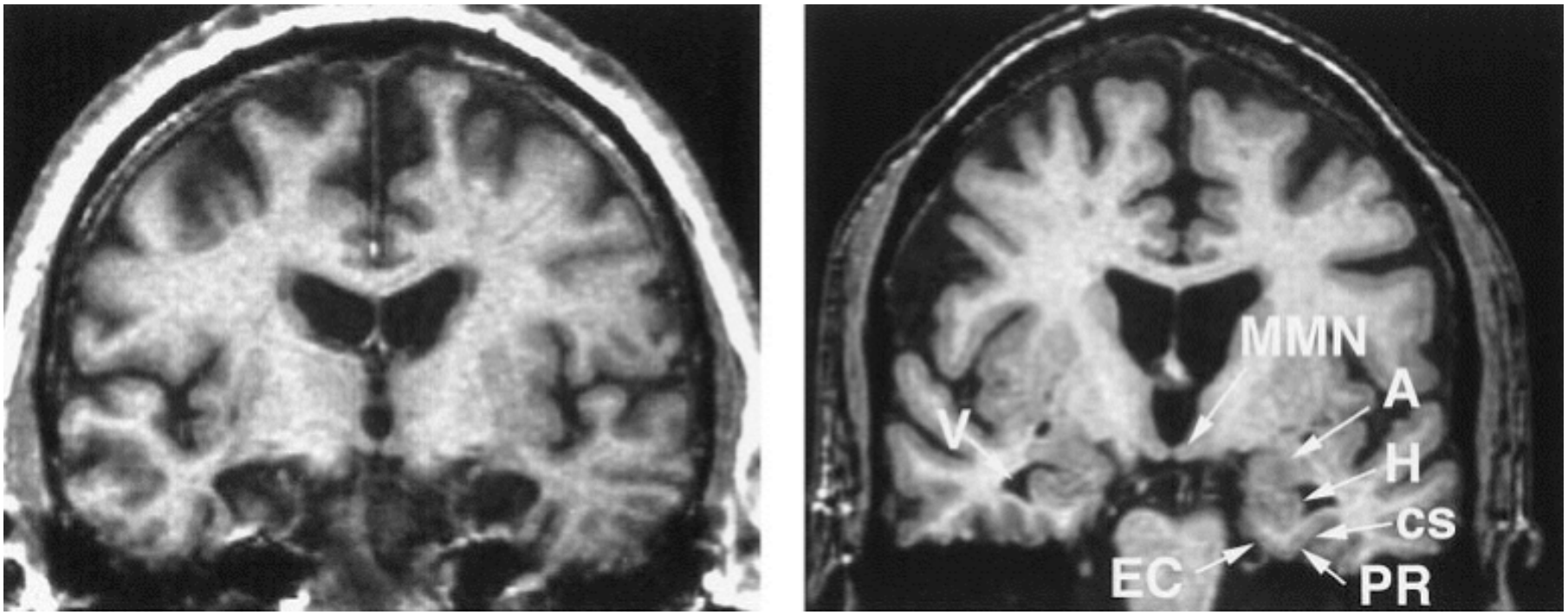
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Hippocampus and entorhinal cortex (H and EC) in normal subject (left), but absent in patient H. M. (right)

H.M.



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GLOBAL IMPAIRMENT OF LEARNING IN MEDIAL TEMPORAL-LOBE AMNESIA

Assessment of Explicit Remembering	*Materials and Events*	*Modalities*
Free recall	**Words, digits, paragraphs**	**Vision**
Cued recall	**Nonsense syllables**	**Audition**
Yes/no recognition	**Faces, shapes**	**Somesthesis**
Multiple choice Recognition	**Clicks, tones, sounds**	**Olfaction**
	Mazes	
Learning to criterion	**Public events, Personal events**	

"Every day is alone in itself, whatever joy I've had and whatever sorrow I've had." (Milner et al, 1968)

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Right now I'm wondering. Have I done or said anything amiss? You see, at this moment everything looks clear to me, but what happened just before? That's what worries me. It's like waking from a dream; I just don't remember." (Milner, 1970)

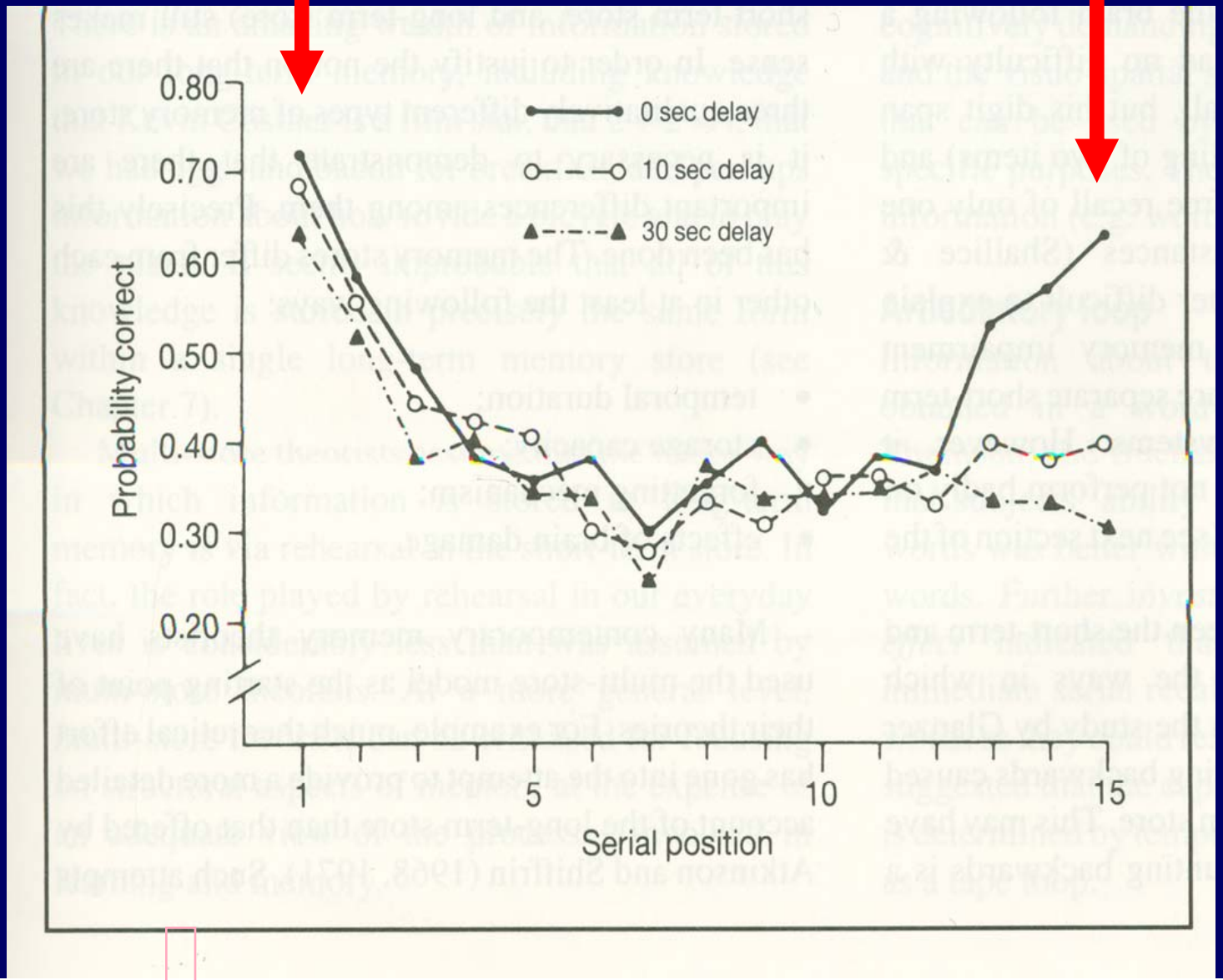
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HM
Henry Molaison
1926-2008

Photos of patient HM removed due to copyright restrictions.

See http://thebrainobservatory.ucsd.edu/content/120209

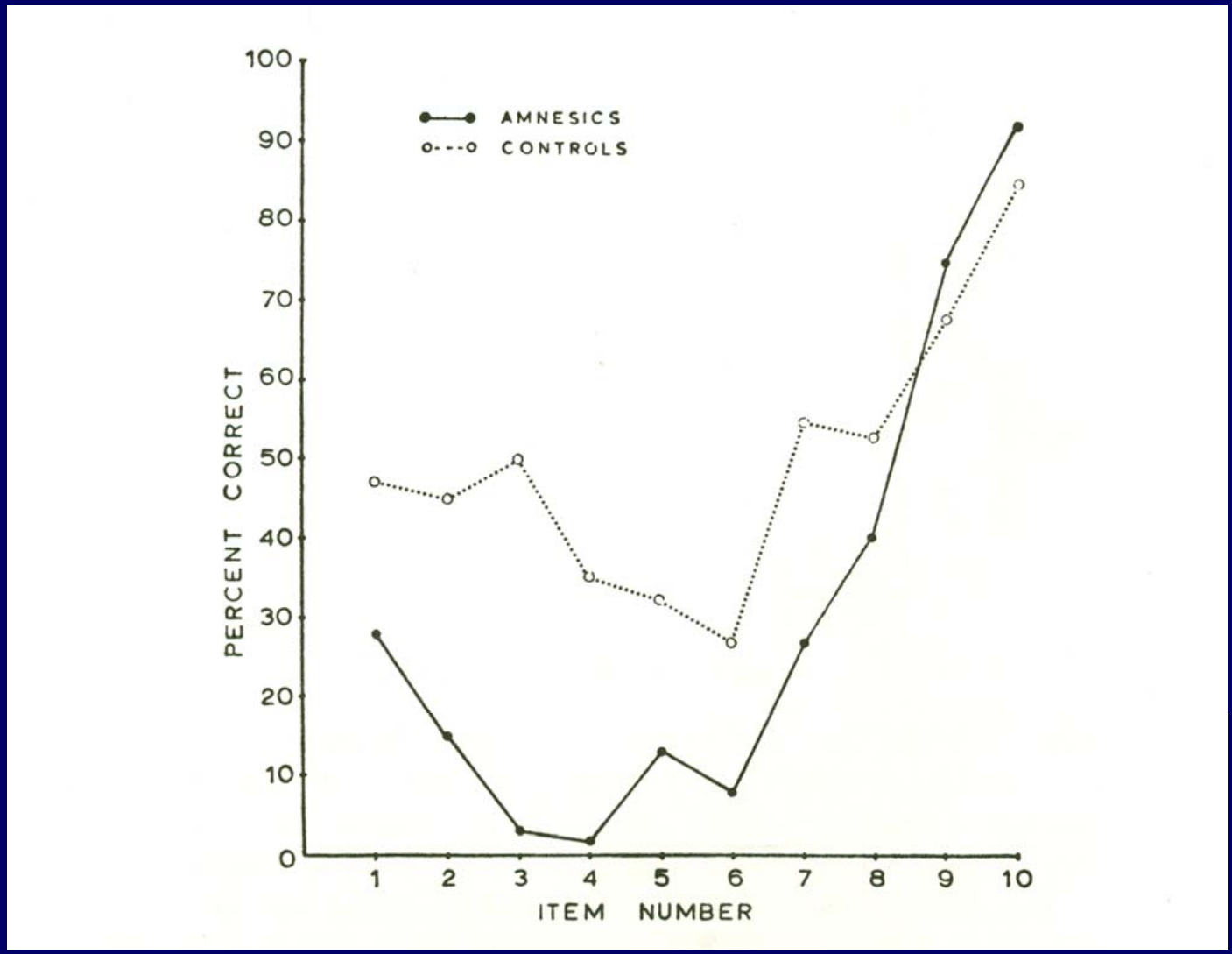
Primacy Effect = LTM Recency Effect = STM



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Intact Recency in Amnesia = Intact STM

Impaired Primacy in Amnesia = Impaired LTM



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Span of 4: 6 1 9 4

Span of 5: 3 7 8 5 2

Span of 6: 9 6 5 2 8 3

Span of 7: 4 2 6 9 8 5 1

Span of 8: 8 1 6 3 7 2 4 9

Span of 9: 6 2 5 7 3 4 9 8 1

Span of 10: 9 3 8 2 4 7 1 5 3 6

Span of 11: 5 8 1 4 7 9 3 2 6 1 7

Digit Span Test: (*hypothetical responses*)

5 7 (correct)
9 1

3 6 1 (correct)
7 2 4

6 1 3 9 (correct)
7 2 5 3

8 4 5 2 6 (correct)
3 6 2 7 5

5 7 4 2 9 8 (correct)
9 3 8 2 7 4 (correct)

5 2 4 8 2 5 7 (correct)
1 7 3 8 5 9 6 (correct)

3 8 4 6 9 1 2 5 (incorrect)
2 6 3 7 4 9 5 1 (incorrect)

3 5 1 7 4 8 2 9 6
8 3 5 1 7 9 6 2 4

Span = 7 digits
Superspan = 8 digits

Hebb Digit Procedure (test at superspan)

8 2 3 6 5 7 9 1 (nonrecurrent sequence)

4 6 1 7 3 8 9 2

2 7 4 3 6 8 5 1 (recurrent sequence)

7 3 5 2 6 1 8 4

2 6 5 9 3 7 1 8

2 7 4 3 6 8 5 1 (recurrent sequence)

7 4 2 6 8 3 1 9

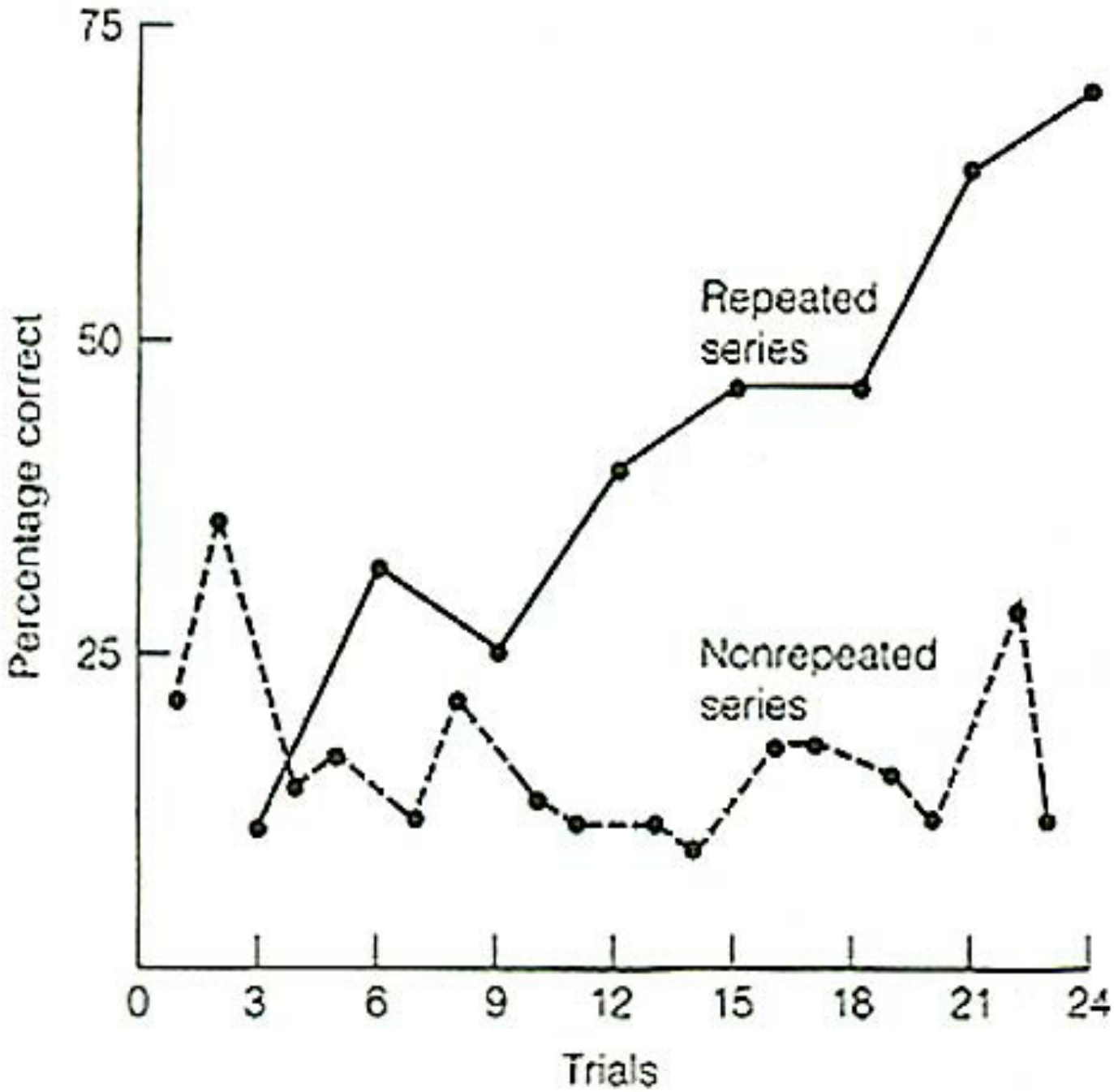
2 9 6 8 1 7 4 3

2 7 4 3 6 8 5 1 (recurrent sequence)

- (nonrecurrent sequence)
- (nonrecurrent sequence)
- (recurrent sequence)
-

repetition makes a LTM beyond STM

but not in HM



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VISUO-SPATIAL STM & LTM (repeated superspan sequences)

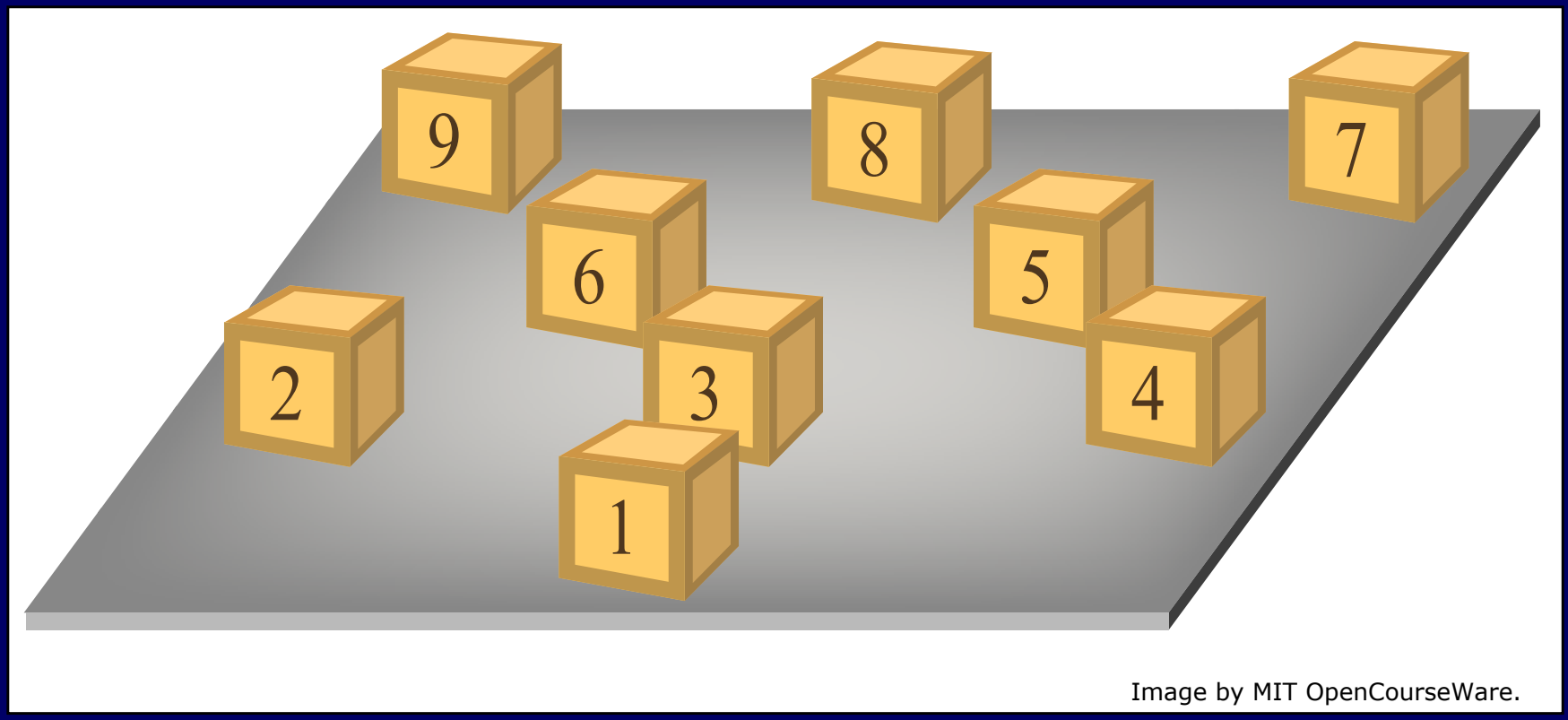


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remove left hippocampus - intact verbal STM, impaired verbal LTM, no effect of removal of right hippocampus

remove right hippocampus - intact spatial STM, impaired spatial LTM, no effect of removal of left hippocampus

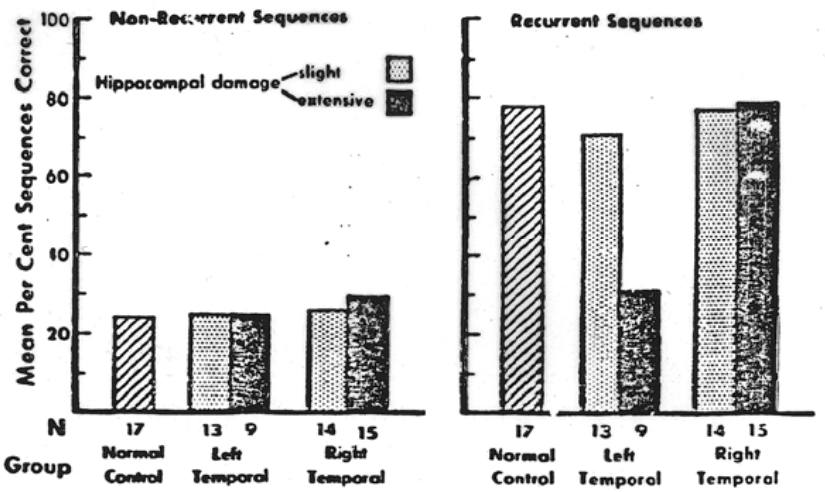


Fig. 6. Digit-sequences task: mean scores for normal control subjects and for left and right temporal-lobe subgroups tested preoperatively. On the left, performance on the non-recurrent sequences; on the right, the more efficient recall of the recurrent sequence by all groups, except those patients with extensive left hippocampal damage.

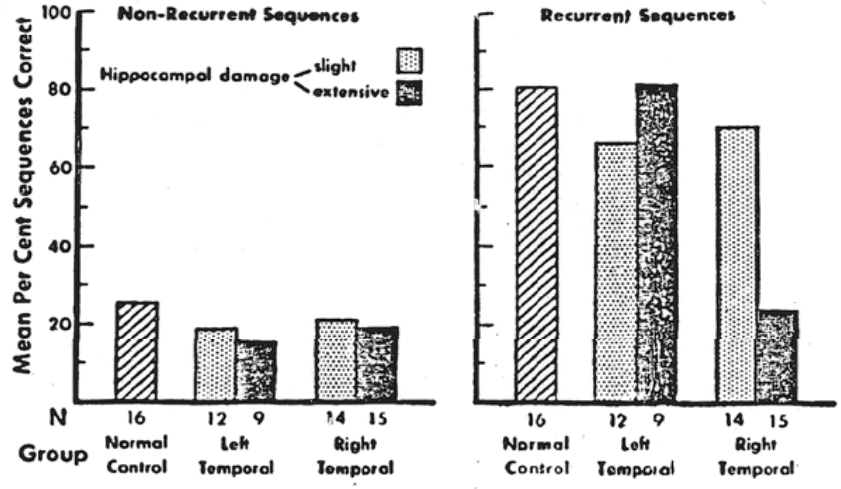
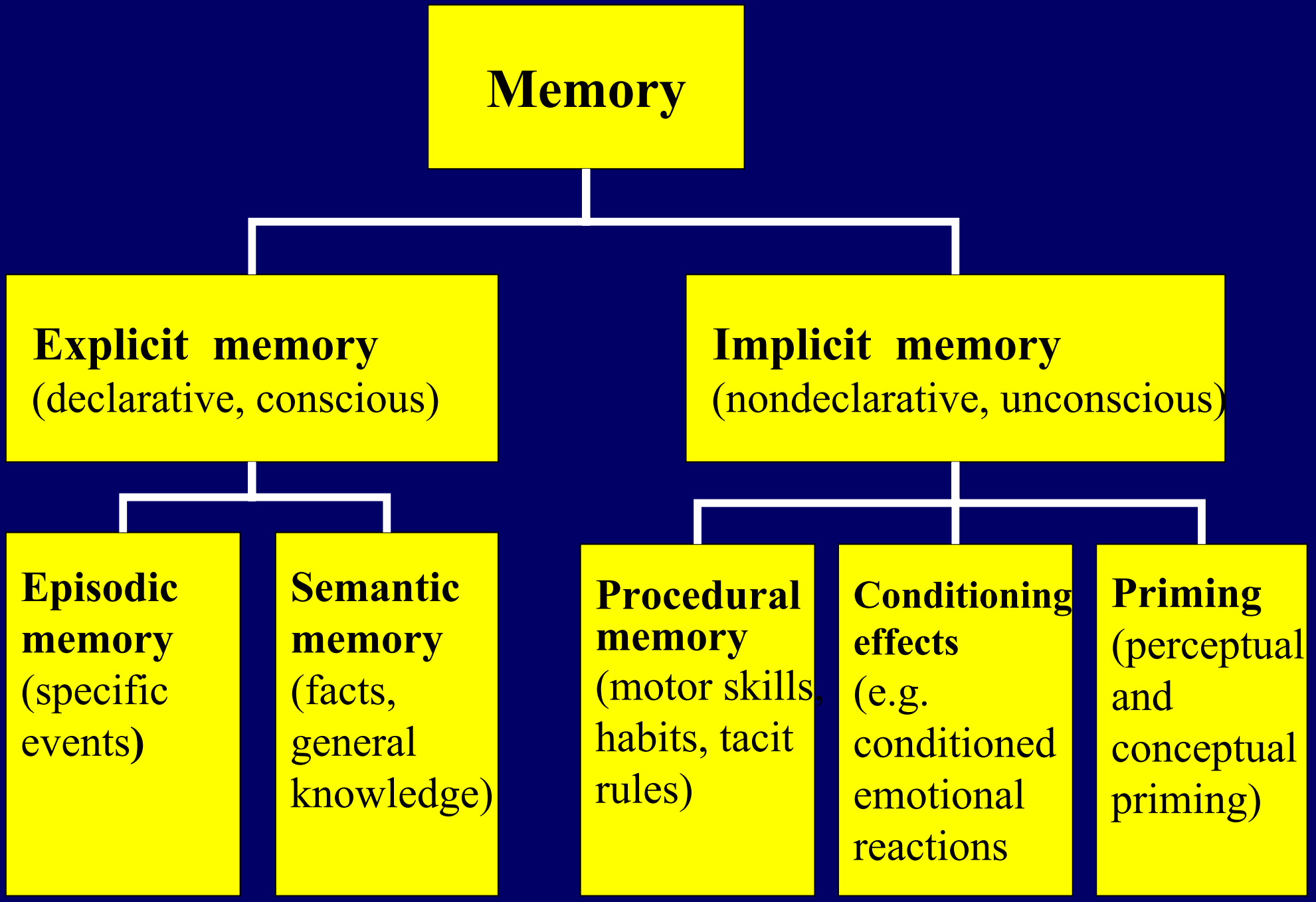


Fig. 7. Block-tapping task: mean scores for normal control groups and for left and right temporal-lobe subgroups tested preoperatively. On the left, performance on the non-recurrent sequences; on the right the more efficient recall of the recurrent sequence by all groups, except those patients with extensive right hippocampal damage.

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Memory
Explicit memory
(declarative, conscious)
Implicit memory
(nondeclarative, unconscious)
Episodic memory
(specific events)
Semantic memory
(facts, general knowledge)
Procedural memory
(motor skills, habits, tacit rules)
Conditioning effects
(e.g. conditioned emotional reactions
Priming
(perceptual and conceptual priming)

Episodic Memory

Memory for events

- time

- space

Semantic Memory

Generic knowledge of facts

H.M.'s Definitions for Words and Phrases Entering the Language after the Onset of His Amnesia

WORD/PHRASE	FOUR-CHOICE RECOGNITION
amniocentesis	an infectious, inflammatory disease of the intestines
apartheid	the separation of young cows that have not yet given birth to calves
boat people	people who cater bon voyage parties
brain wash	the fluid that surrounds and bathes the brain
granola	a portable keyboard wind instrument
software	expensive clothing made of a soft, twilled fabric

MEMORY I *Anterograde Amnesia*

1. Lashley & the distributed/localized dichotomy

2. H.M. & anatomy of human amnesia
 - Medial temporal region/hippocampus

3. Spared immediate memory/impaired new learning
 - Primacy/recency distinction
 - Hebb repeating digits

4. Material-specific amnesia
 - left hippocampus & superspan verbal learning
 - right hippocampus & superspan nonverbal learning

5. Semantic/episodic distinction in relation to anterograde amnesia - both kinds of memory impaired

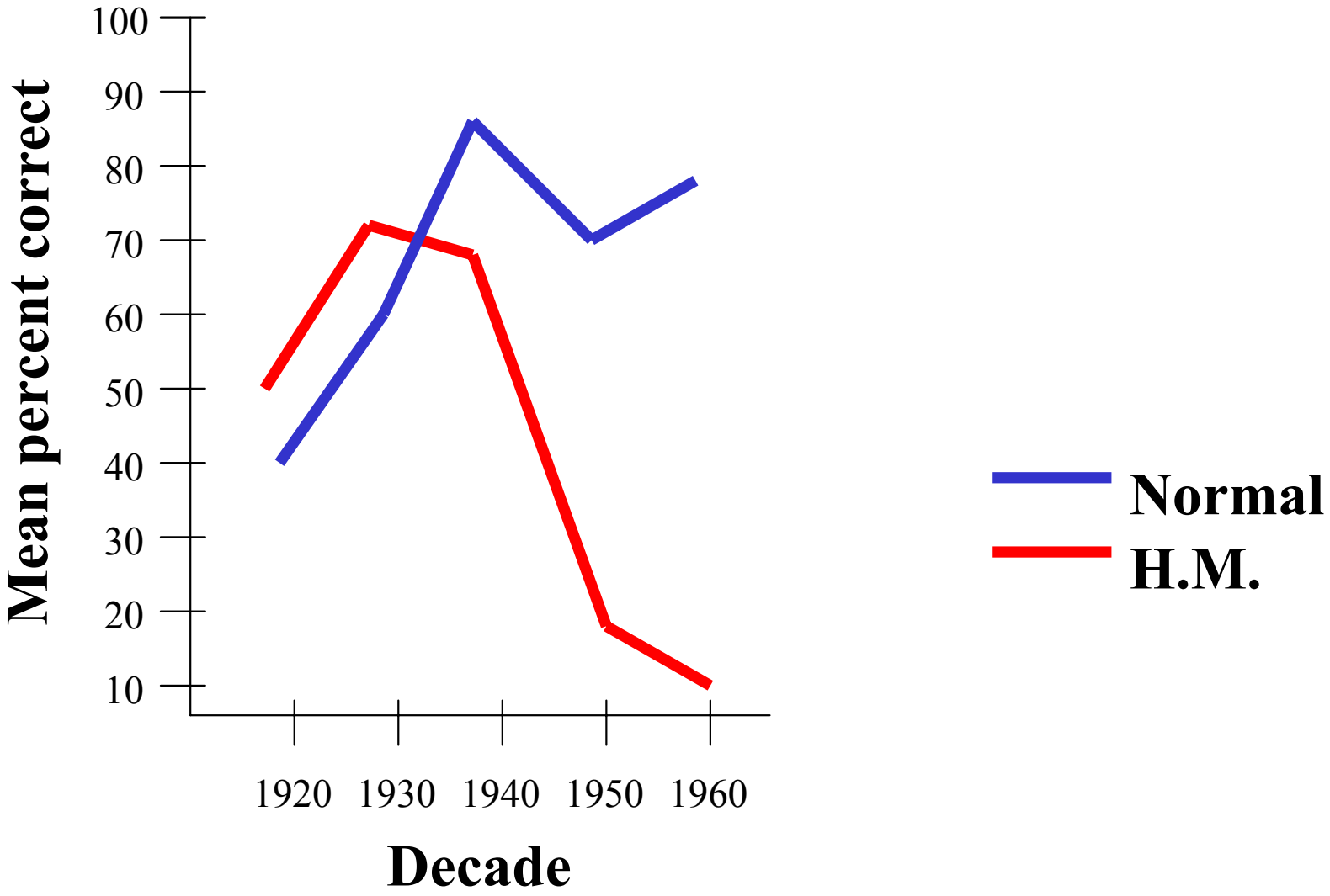
MEMORY II

- **Retrograde Amnesia**

 loss of already known information

Famous Faces

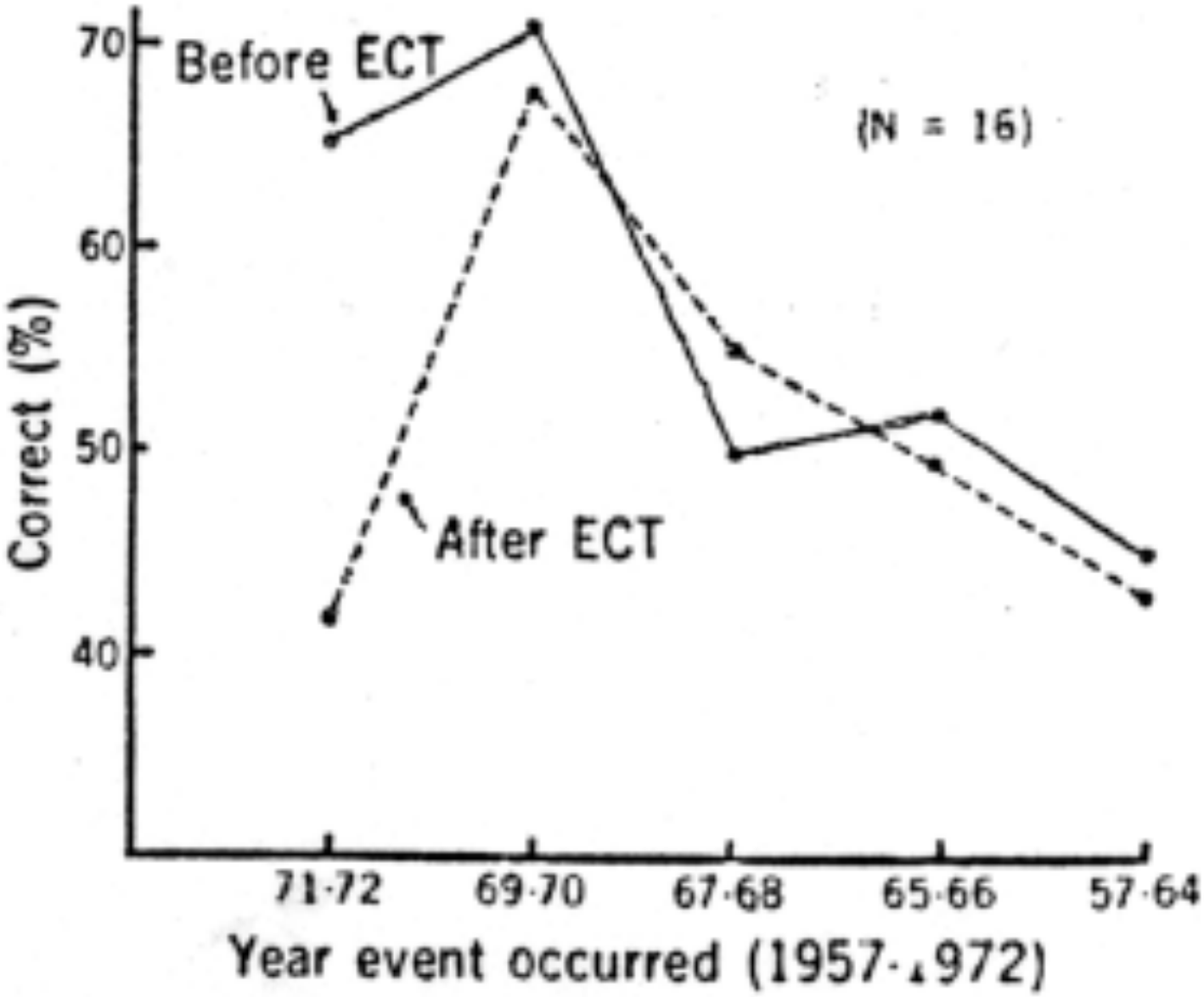
temporally limited retrograde amnesia



**** *** ** *

Bus driver in Washington, DC **drug store Boston** **mattress factory Boston** **hospitalized BostonVA**

- **November 26, 1965** **33 year old male**
 - **-subcutaneous hematoma in right temporal-parietal area**
 - **-stupor, semicomatose, aphasic**
- **December 26, 1965**
 - **-sensorimotor recovery - digit span of 6**
 - **-stated date as 3 or 4 weeks ago**
 - **-severe anterograde amnesia (failed to recognize nurses)**
 - **-believed that he lived in Washington**
- **March 1, 1966**
 - **- anterograde amnesia resolves (learned nurse's names)**
 - **- could not remember moving, accepted living in Boston**
 - **-then that he worked at drug store**
 - **-then that he worked at mattress factory**
 - **-discharged - lost only 24 hours**



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evidence in primates for temporally limited retrograde amnesia

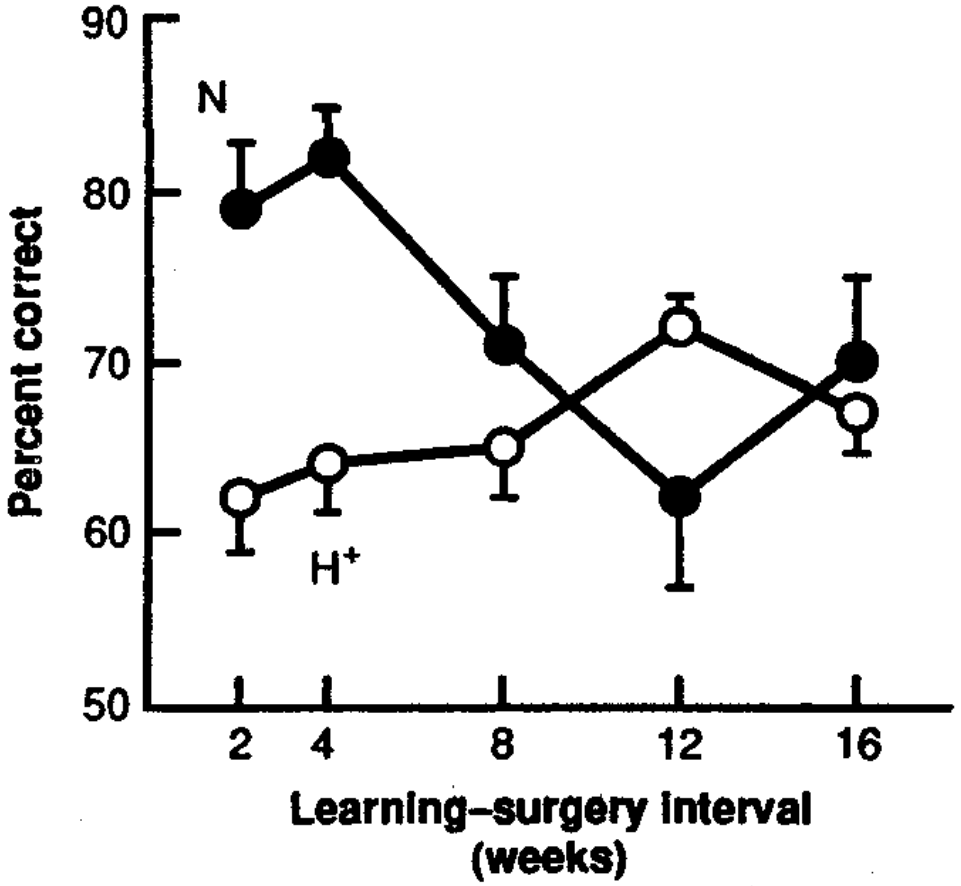
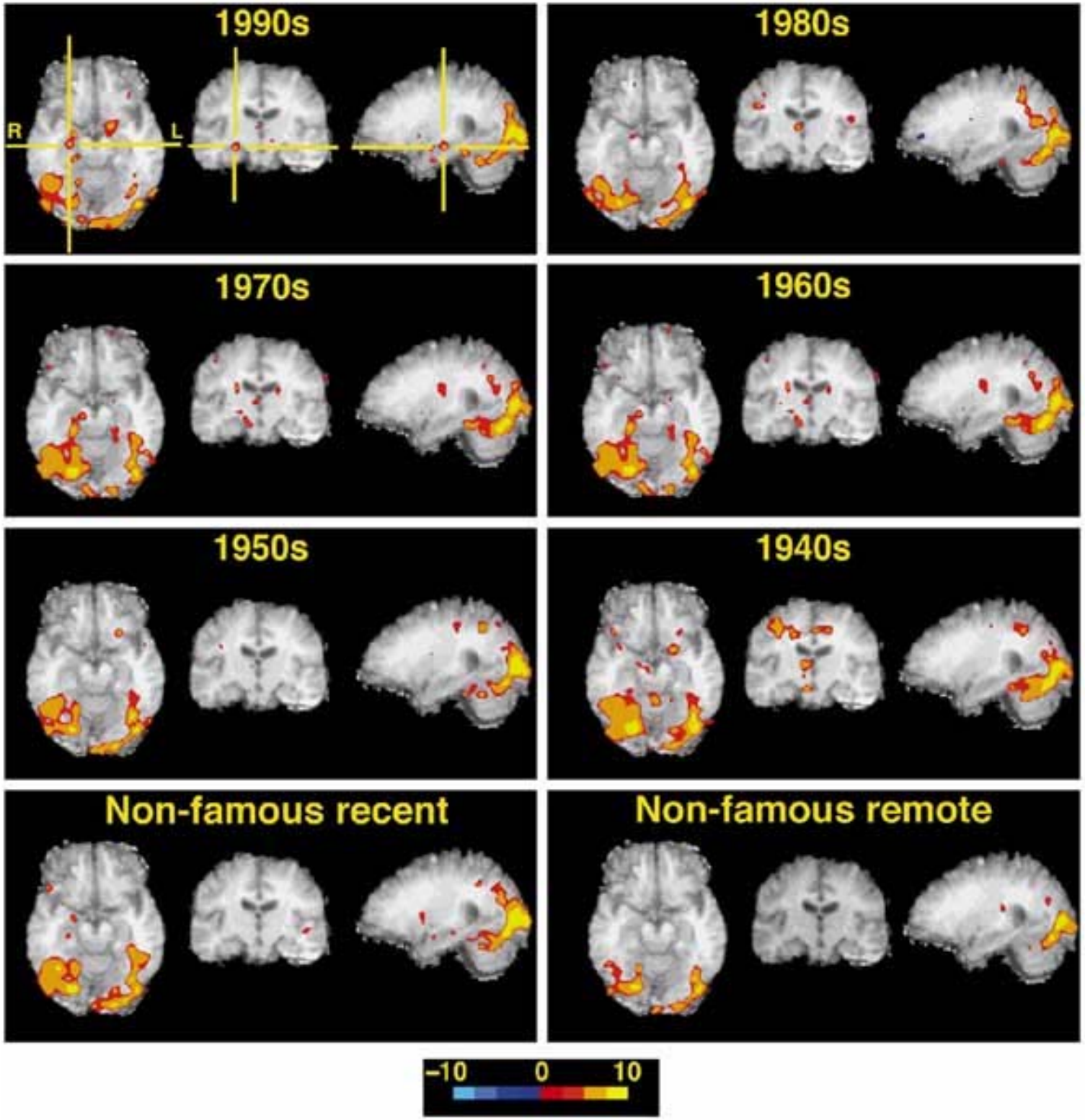


Fig. 2. Retention of 100 object discrimination problems learned approximately 2, 4, 8, 12, and 16 weeks before hippocampal surgery (20 pairs per time period). Retention was assessed 2 weeks after surgery in monkeys with lesions (H^+) (○) ($n = 11$) or after an equivalent interval in unoperated animals (N) (●) ($n = 7$). Brackets show standard error of the mean.

Source: Zola-Morgan, S. M., and L. R. Squire. "The Primate Hippocampal Formation: Evidence For a Time-Limited Role in Memory Storage." *Science* 250, no. 4978 (1990): 288-90. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

imaging activations for famous faces for different decades



Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience. Source: Haist, F., et al. "Consolidation of Human Memory Over Decades Revealed by Functional Magnetic Resonance Imaging." *Nature Neuroscience* 4, no. 11 (2001): 1139-45. © 2001.

B. Retrograde Amnesia

1. H.M. & Famous Faces
 - remote memory spared in amnesia
 -- hippocampus *not* the long-term site of memory storage
2. Shrinking retrograde amnesia
 - Link between anterograde and retrograde amnesia
3. ECT study
4. Squire & Zola-Morgan monkey study
 -- hippocampus necessary for consolidating a memory for an extended period- once consolidated, hippocampus no longer involved
5. fMRI evidence with famous faces from different decades

MEMORY III

- **Memory Systems**

 specific neural networks that record, retain, and retrieve particular kinds of memory

Memory System

- ***particular*** **neural network**
- ***specific*** **mnemonic process**

Measures of Memory

Explicit (direct)

- **Recall**
- **Cued Recall**
- **Recognition**

Implicit (indirect)

- **Skill learning**
- **Repetition priming**
- **Conditioning**

DECLARATIVE/PROCEDURAL MEMORY DISTINCTION

Declarative Memory

- directly accessible to conscious recollection
- facts and episodes
- knowing that

Procedural Memory

- accessible only through performance
- knowing how

SKILL LEARNING

- **Improved performance (accuracy, speed) with practice on a motor, perceptual, or cognitive task**

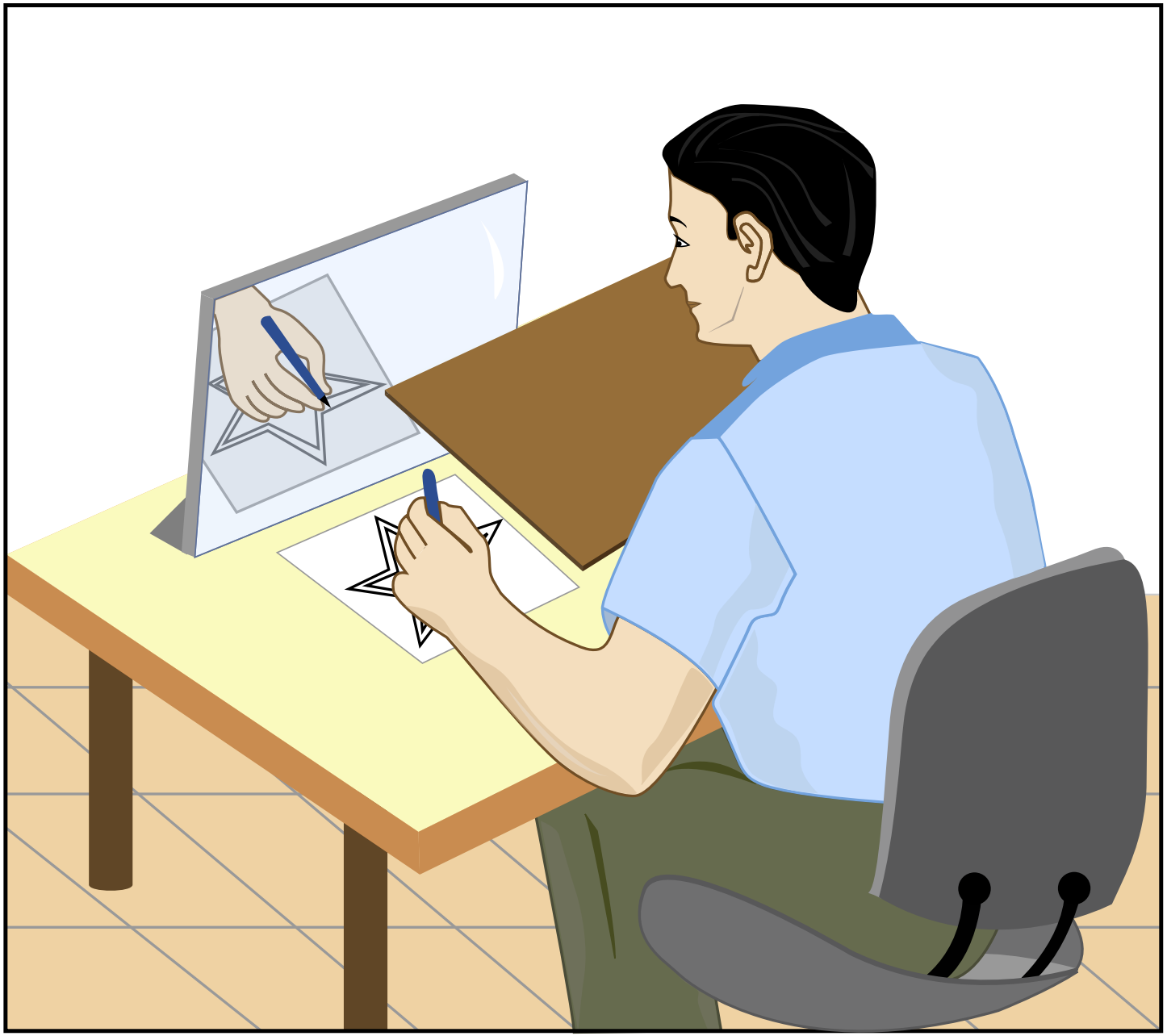
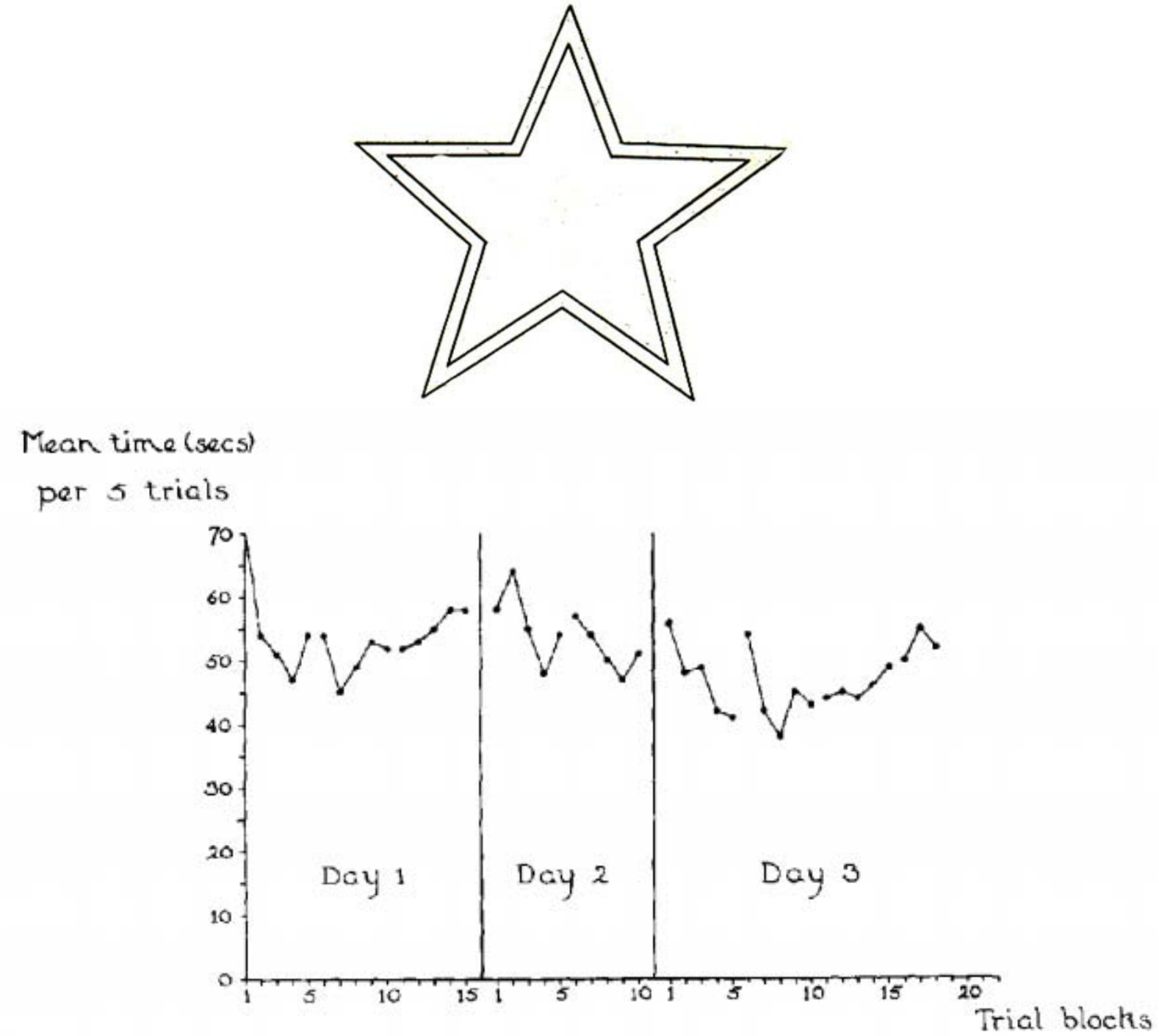


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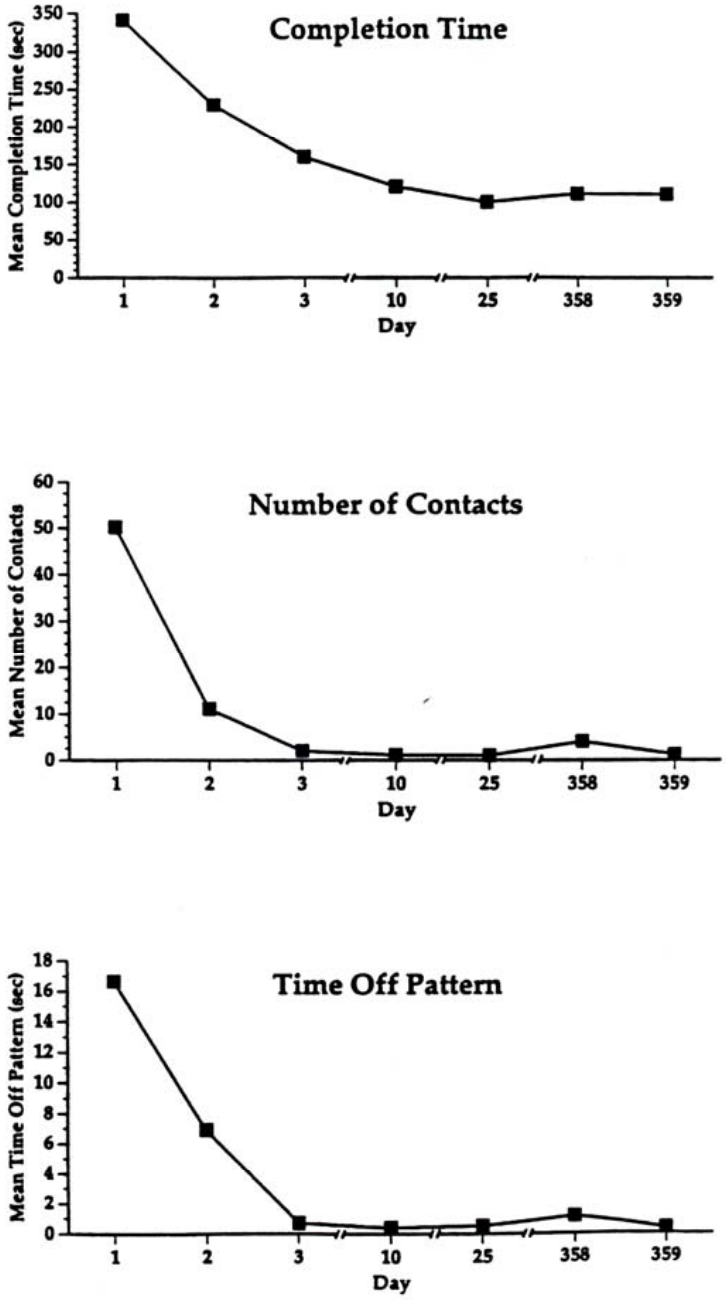
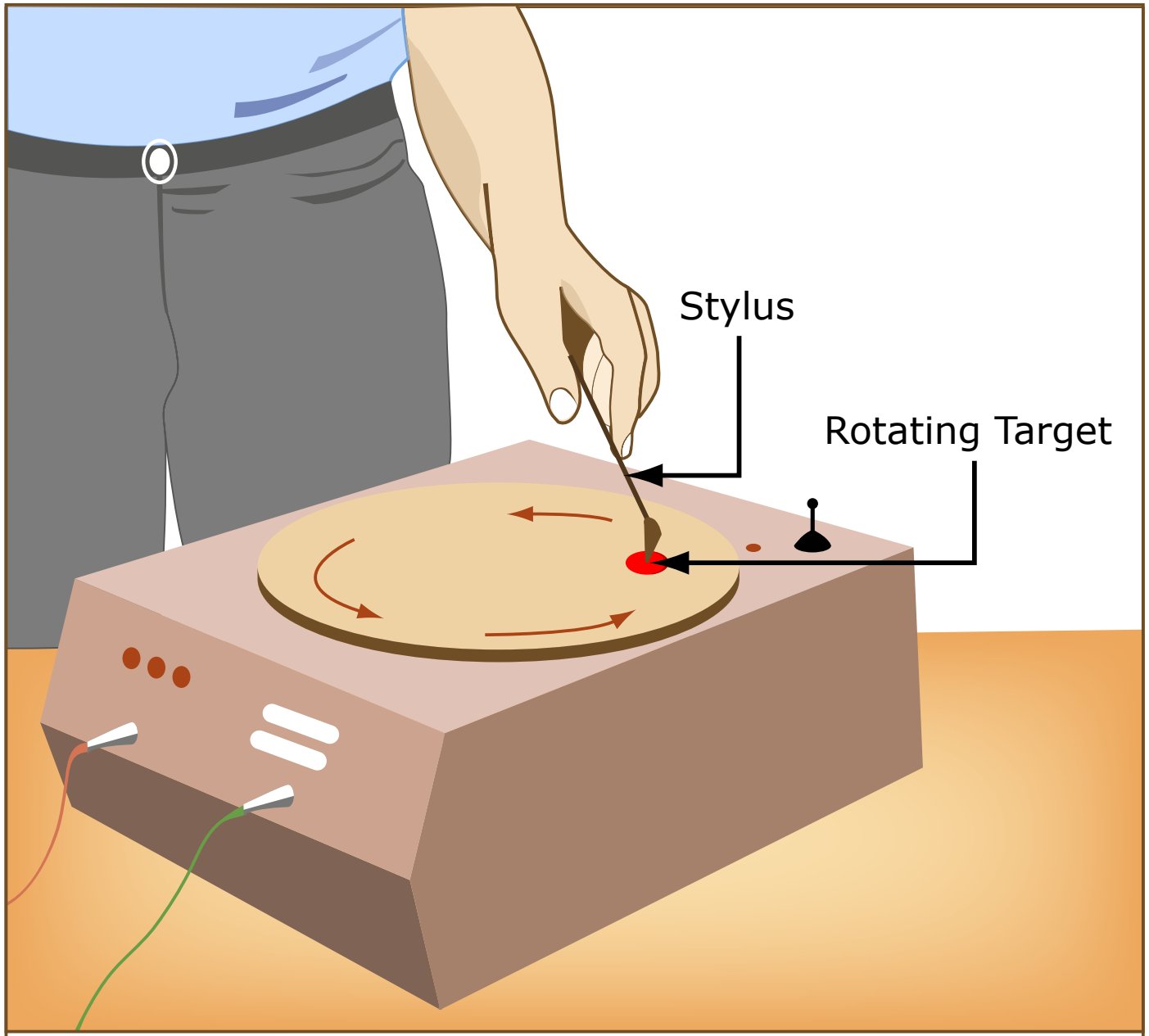


Figure 3.. Mirror-tracing results for H.M. (Top: Mean completion time per day for 3 consecutive days and after intervals of 1 week, 2 weeks, and nearly 1 year. Middle: Mean number of contacts for the same trials. Bottom: Mean time spent off pattern for the same trials.)

Courtesy of American Psychological Association. Used with permission.



Rotary-pursuit task. While the target rotates, the subject tries to keep the stylus in contact with it.

Image by MIT OpenCourseWare.

HUNTINGTON'S DISEASE (HD)

Etiology

- genetic (autosomal dominant)

Frequency

- 5/1,000,000
- usual onset in 30s or 40s

Symptoms

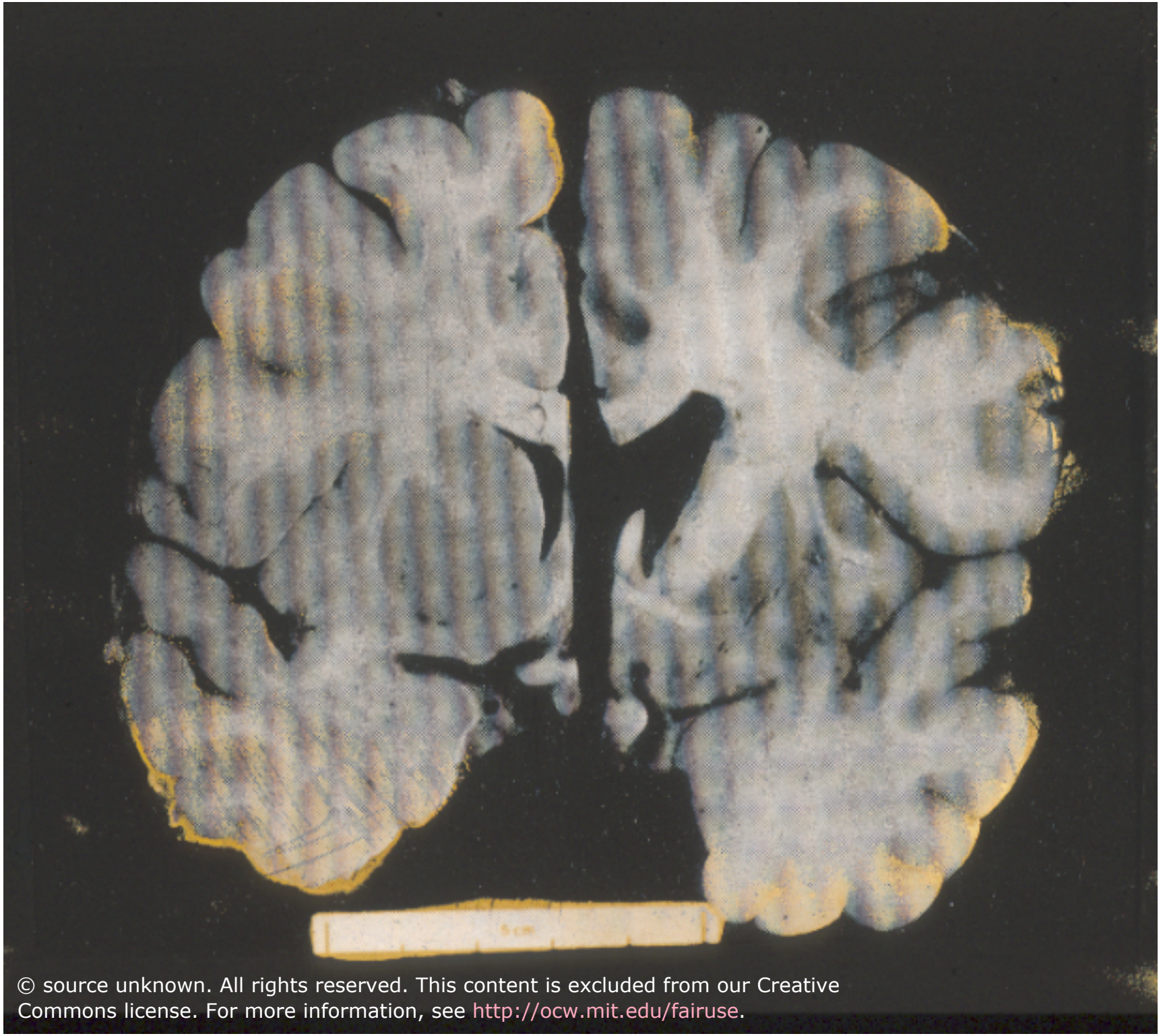
- Motoric
 - Choreiform movements
 - Athetosis
- Cognitive
 - Progressive dementia
- Psychiatric
 - Depression, disinhibition, mood disturbance

Neural Systems

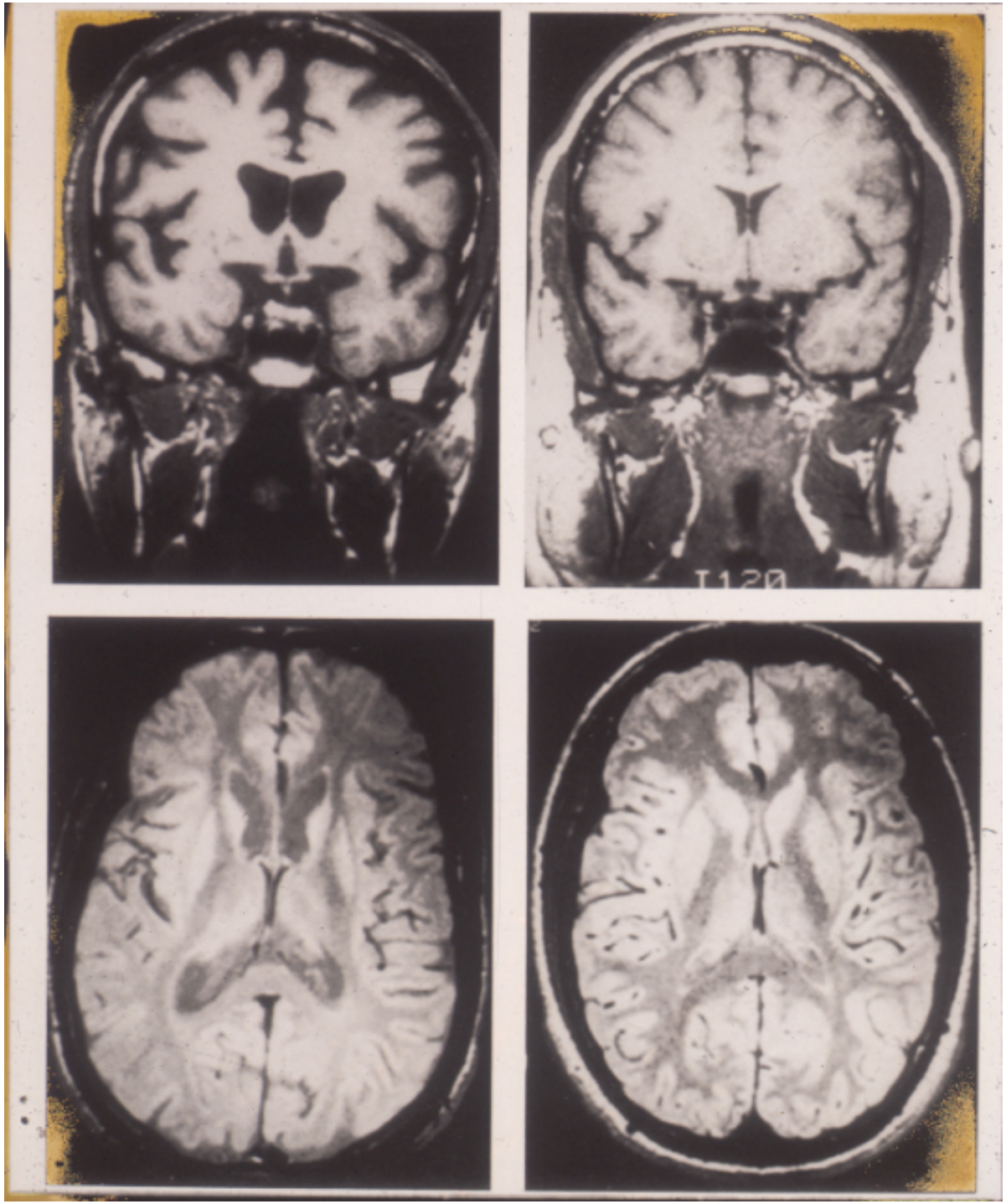
- Caudate and putamen
 - (putamen may be more affected in earliest stages)
- More moderate frontal and temporal gyral atrophy

Treatment

- none

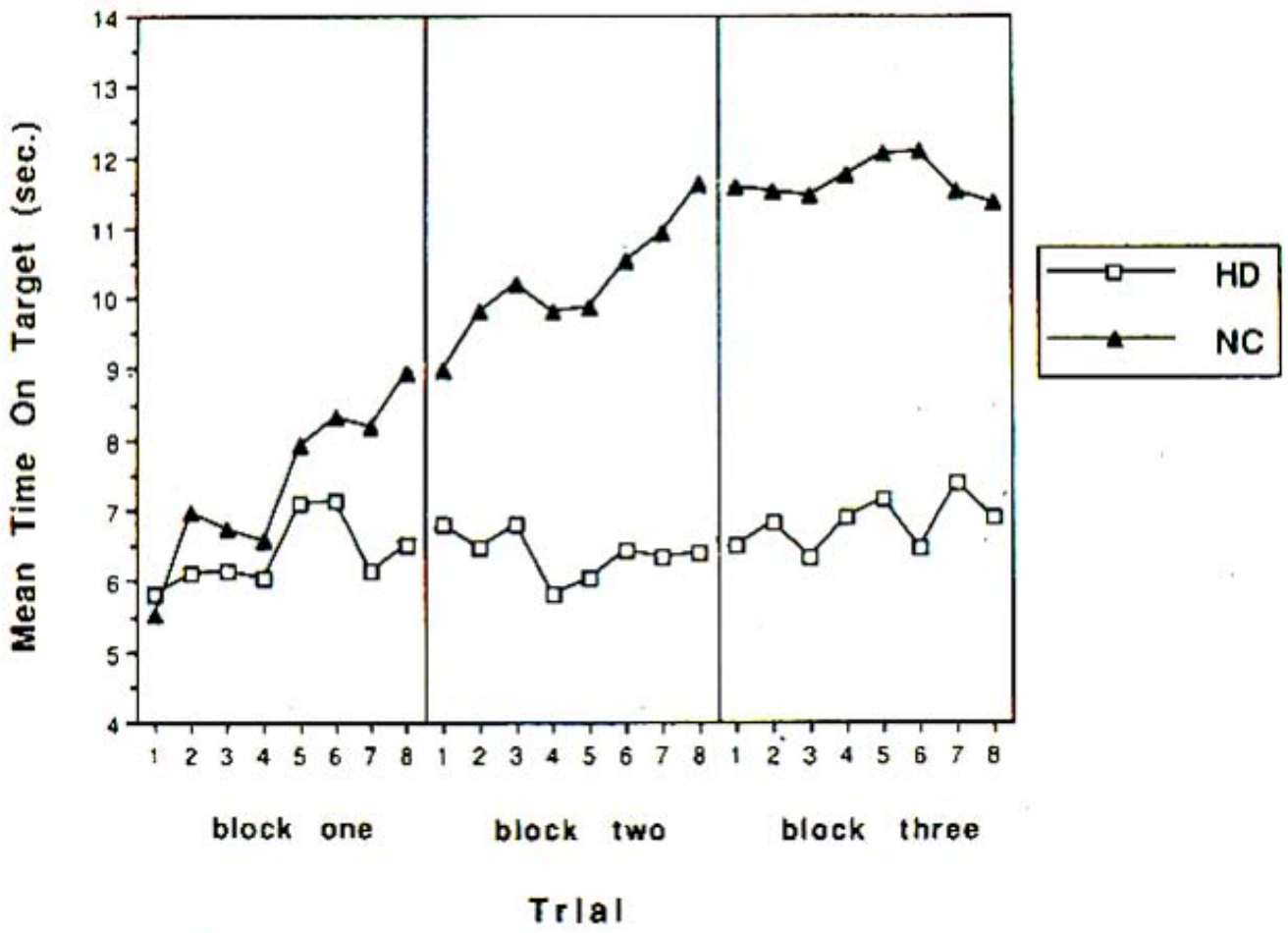


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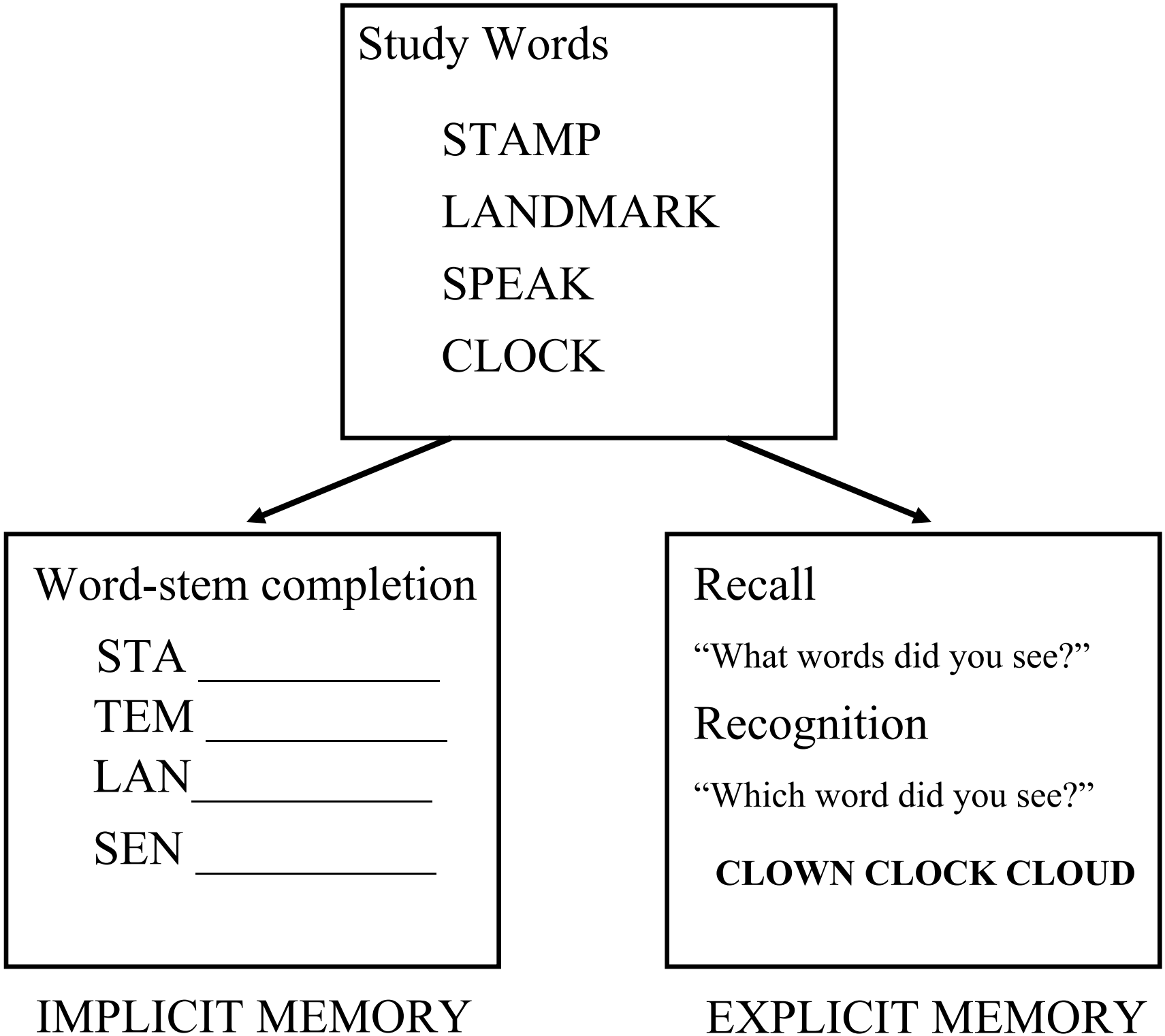
ROTARY PURSUIT LEARNING IMPAIRED IN HD



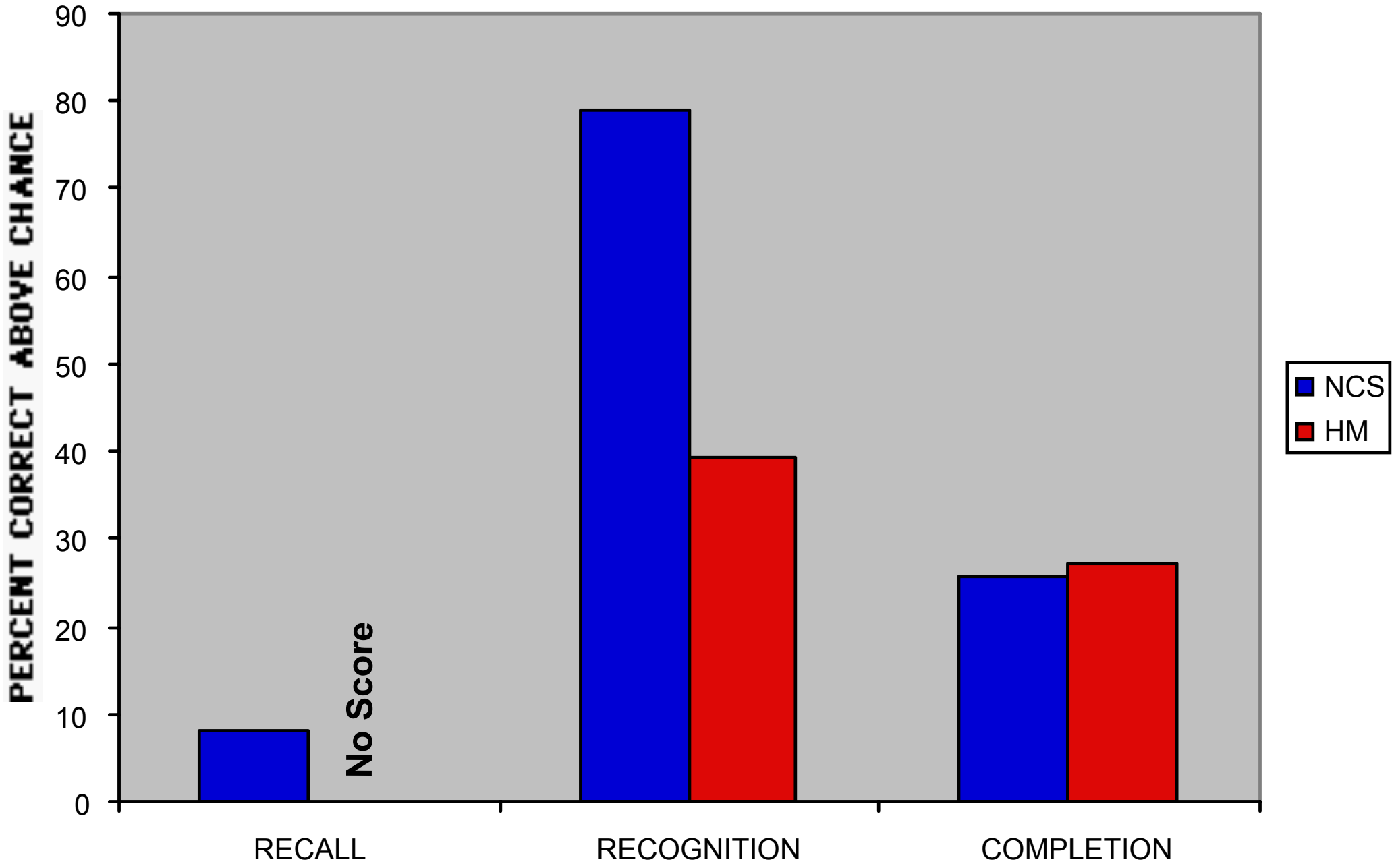
See Gabrieli, J. D. E., et al. *Neuropsychology* 11, no. 2 (1997): 272-81.

REPETITION PRIMING

- Change in performance (accuracy, speed) with a stimulus (e.g., word or picture) due to prior processing of that stimulus or a related stimulus


Study Words
STAMP
LANDMARK
SPEAK
CLOCK
Word-stem completion
STA _____
TEM _____
LAN_____
SEN _____
Recall
"What words did you see?"
Recognition
"Which word did you see?"
CLOWN CLOCK CLOUD
IMPLICIT MEMORY
EXPLICIT MEMORY

Intact Repetition Priming in HM



Behavioral Pathology in Alzheimer's Disease

- insidious and progressive dementia
- * memory (amnesia) *
- language (aphasia)
- thinking, planning, judgement
- concentration, attention
- spatial thinking
- mood and personality

MULTIFOCAL NEUROPATHOLOGY IN ALZHEIMER'S DISEASE

DENSE NEUROPATHOLOGY

- hippocampal complex
- association neocortex
 temporal lobes, parietal lobes, frontal lobes

MILD NEUROPATHOLOGY

- basal ganglia
- cerebellum
- primary motor cortex
- primary sensory cortices

 occipital lobe (vision)

 temporal lobe (audition)

 parietal lobe (touch)



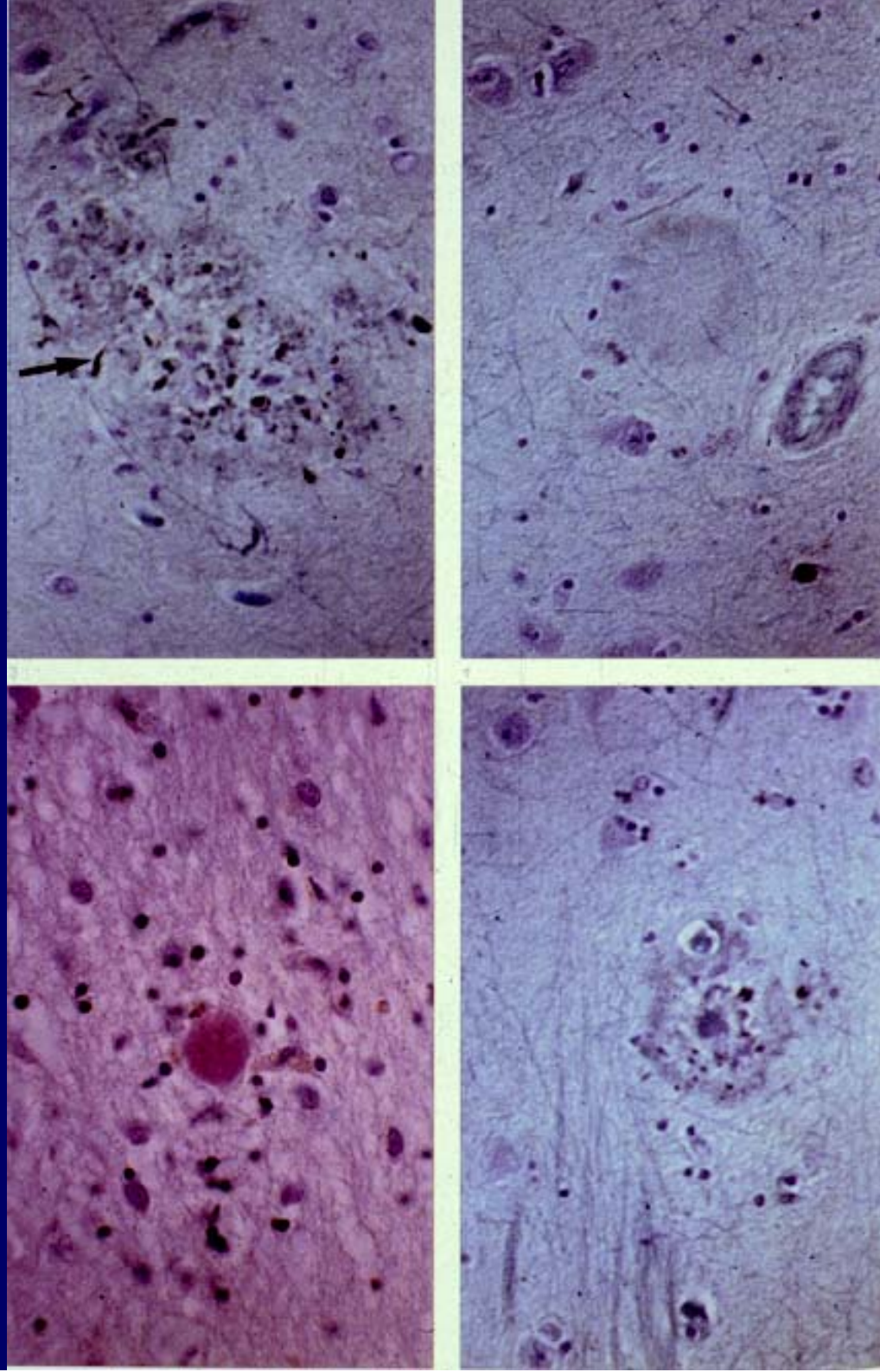
AD Patient **Control**

Courtesy of The Gladstone Institutes. Used with permission.

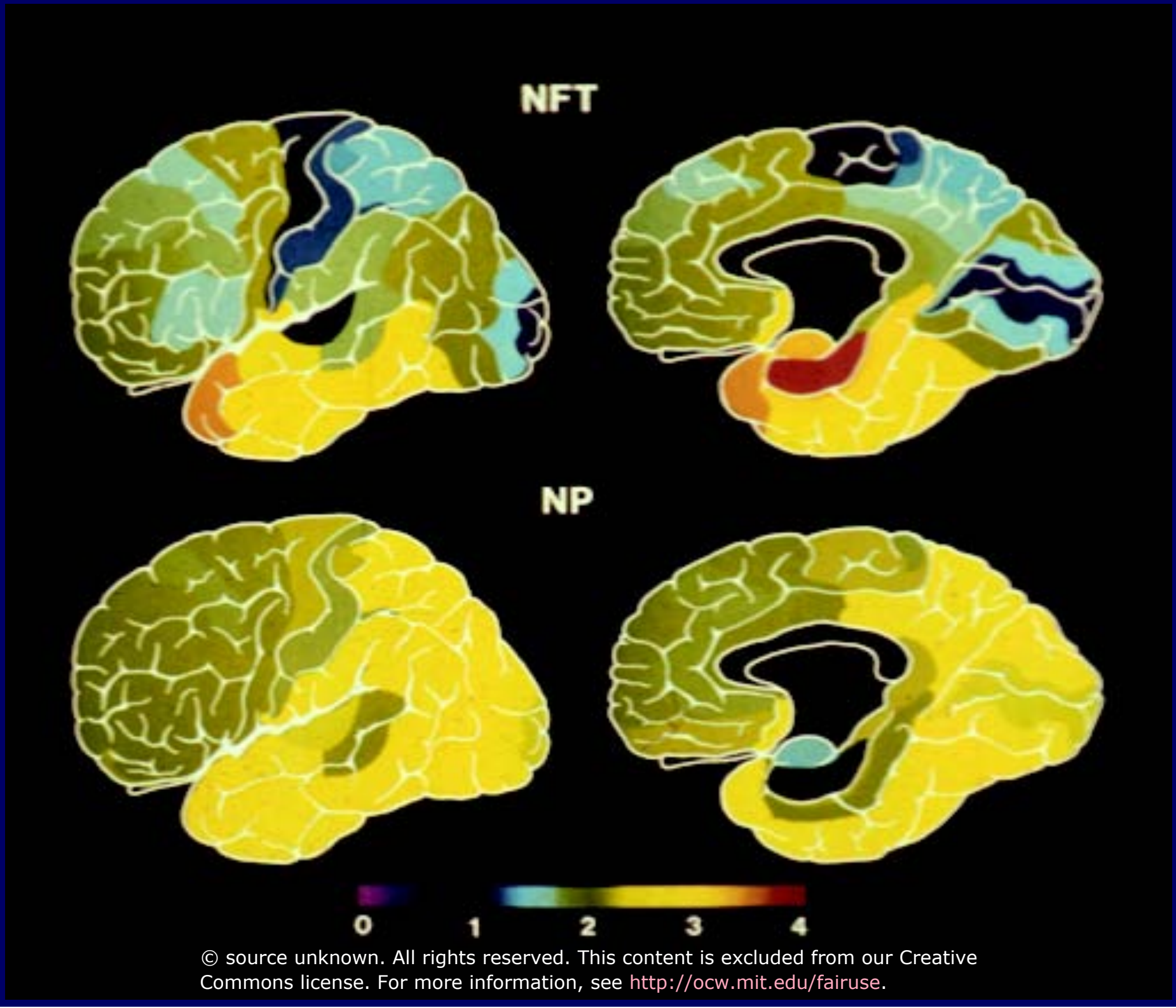
Cellular Pathology of AD

neurofibrillary tangles

amyloid plaques

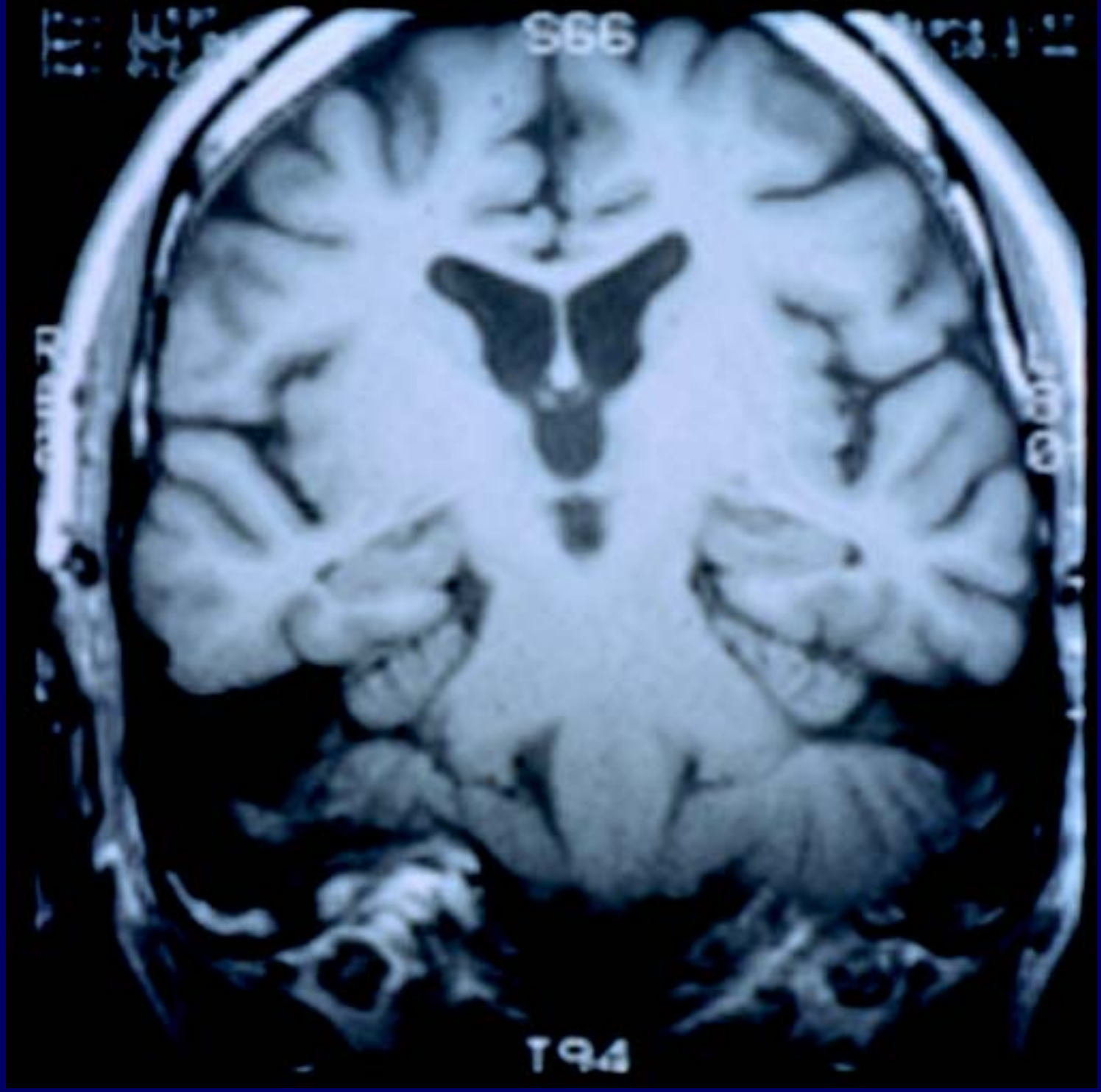


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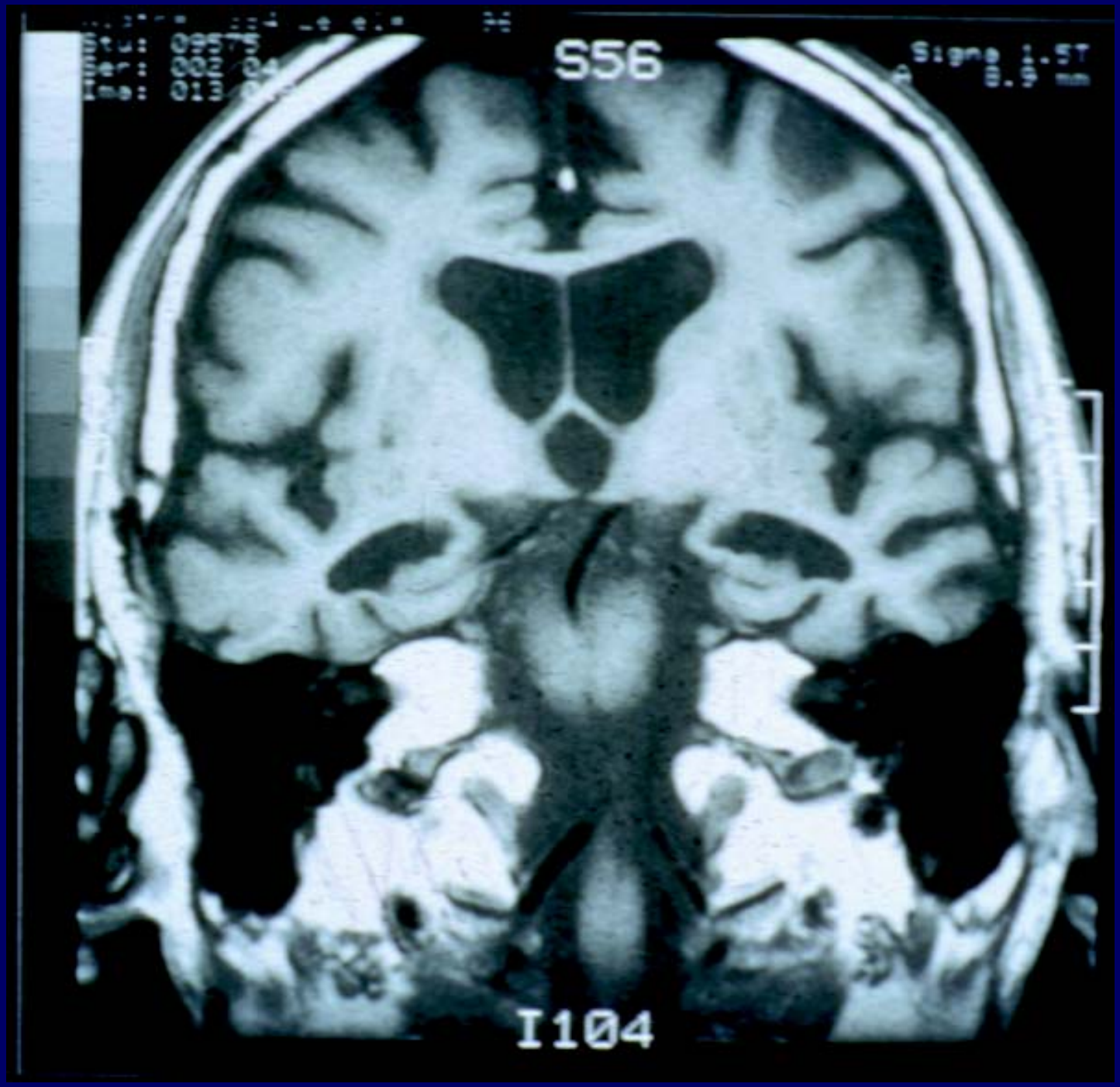
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Healthy 81 year old structural MRI



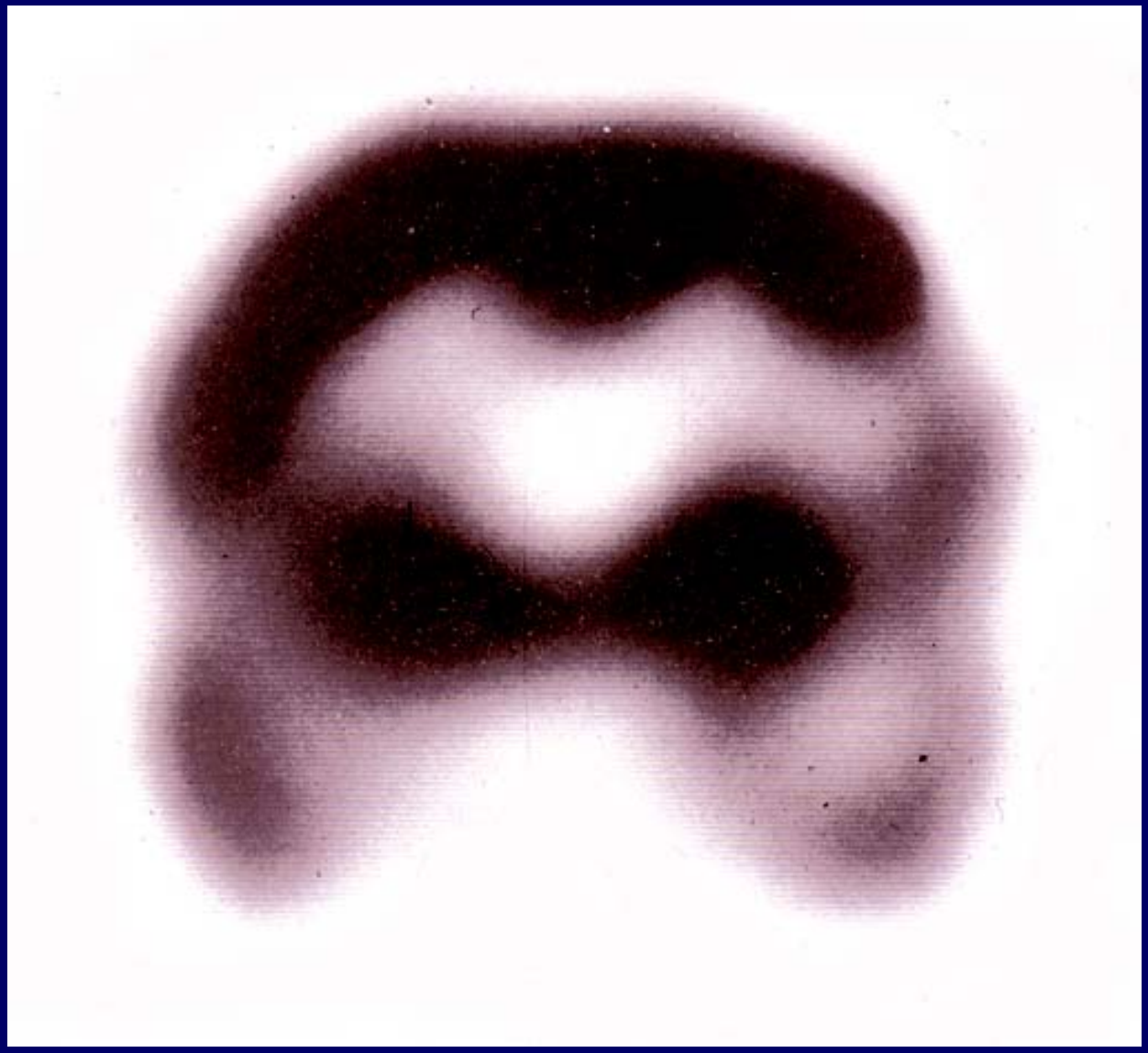
Courtesy of Leyla de Toledo-Morrell. Used with permission.

AD patient
80 years old
structural
MRI



Courtesy of Leyla de Toledo-Morrell. Used with permission.

Healthy Elderly Adult

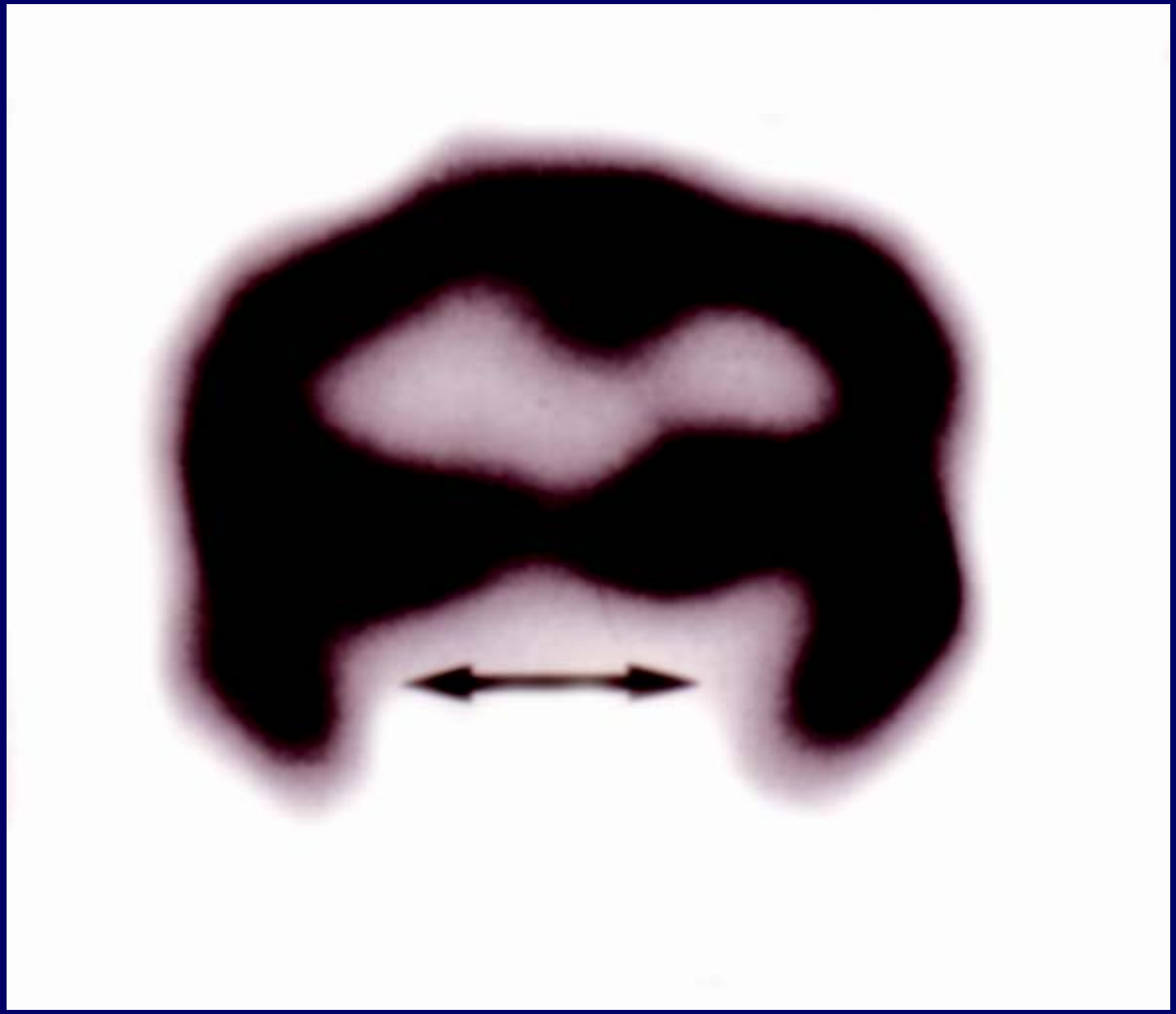


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blood flow & metabolism

Single Photon Emission Computed Tomography - SPECT

H.M.



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Single Photon Emission Computed Tomography - SPECT

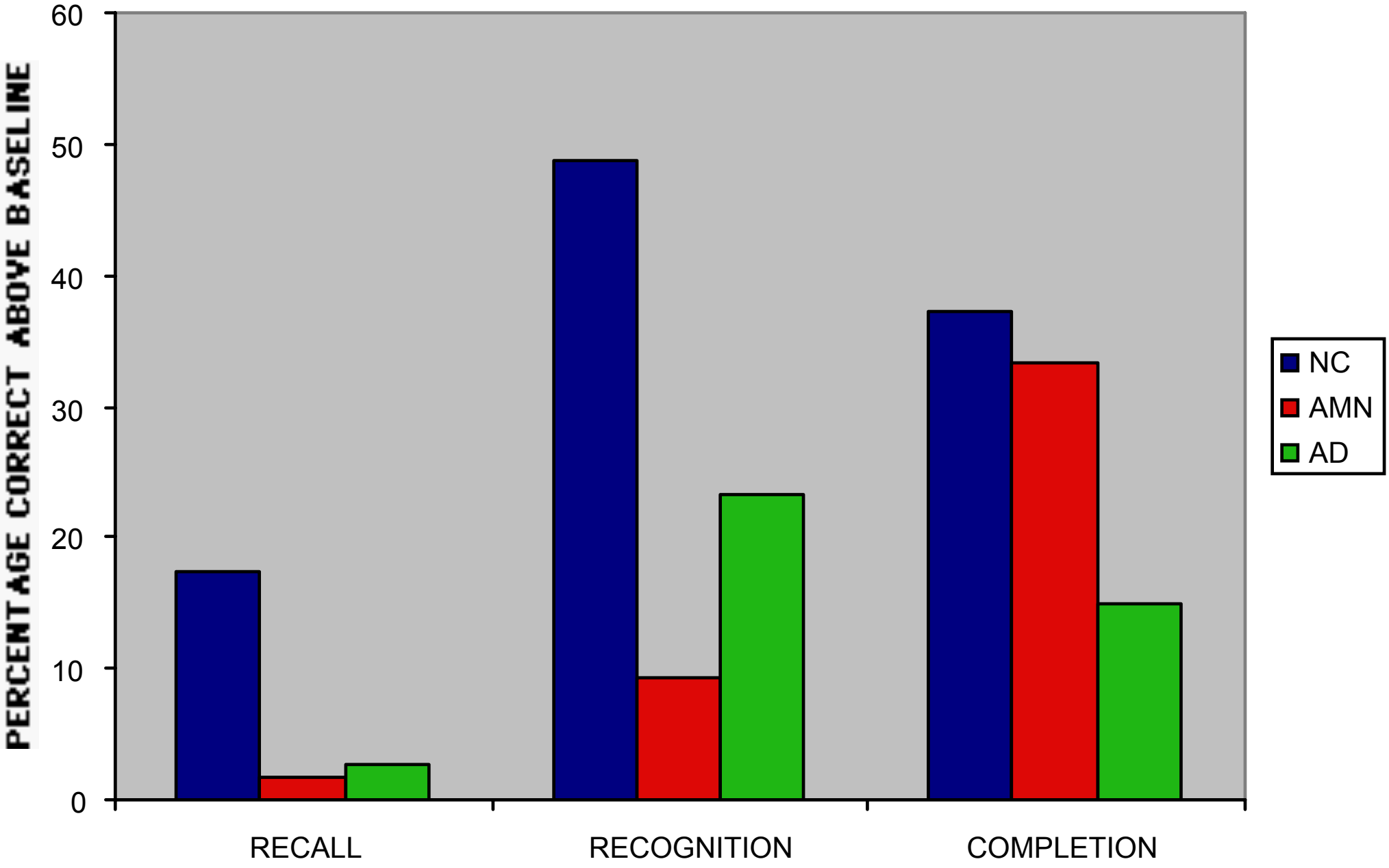
AD Patient



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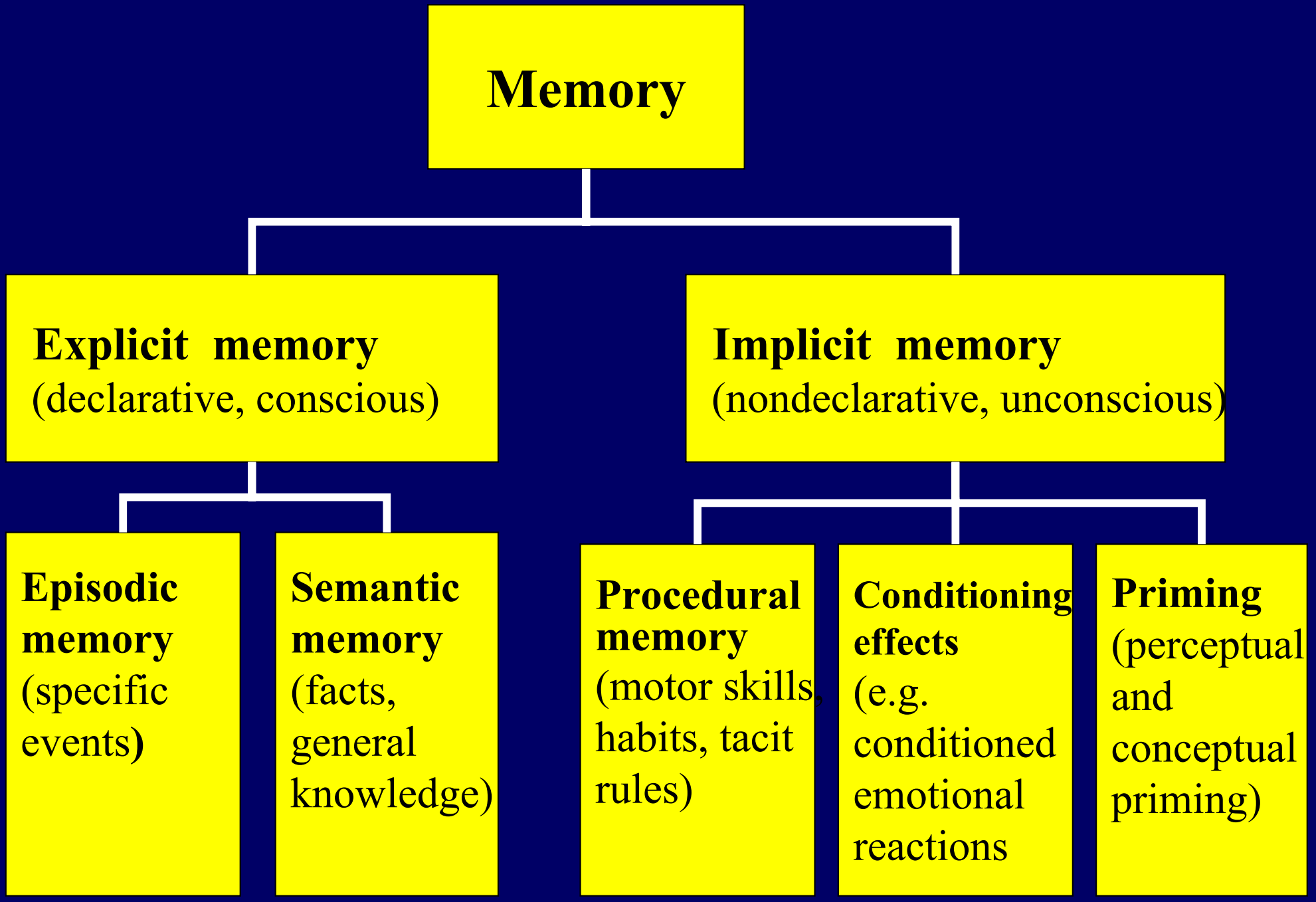
Single Photon Emission Computed Tomography - SPECT

Impaired Repetition Priming in AD



THREE MEMORY SYSTEMS

Kind of Memory	*Patient Information*	*Neural System*
Explicit / Declarative	**Amnesia**	**Medial Temporal Lobe**
Skill Learning *(rotary pursuit)*	**Huntington's Disease**	**Basal Ganglia**
Repetition Priming *(word-stem completion)*	**Alzheimer's Disease**	**Neocortex**


Memory
Explicit memory
(declarative, conscious)
Implicit memory
(nondeclarative, unconscious)
Episodic memory
(specific events)
Semantic memory
(facts, general knowledge)
Procedural memory
(motor skills, habits, tacit rules)
Conditioning effects
(e.g. conditioned emotional reactions
Priming
(perceptual and conceptual priming)

Is memory in the brain *distributed* or *localized*???

"It is not possible to demonstrate the isolated localization of a memory trace anywhere in the nervous system…The engram is represented throughout the region"

Karl Lashley 1950

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LANGUAGE

Professor John Gabrieli

LANGUAGE

- Comprehension
 - Auditory
 - Visual
- Production
 - Speaking
 - Writing

Endlessly generative - 100 trillion years to memorize all the sentences we can produce

LANGUAGE

- Phonology - sounds of language
- Syntax (grammar, structure)
- Semantics (meaning)
- Pragmatics

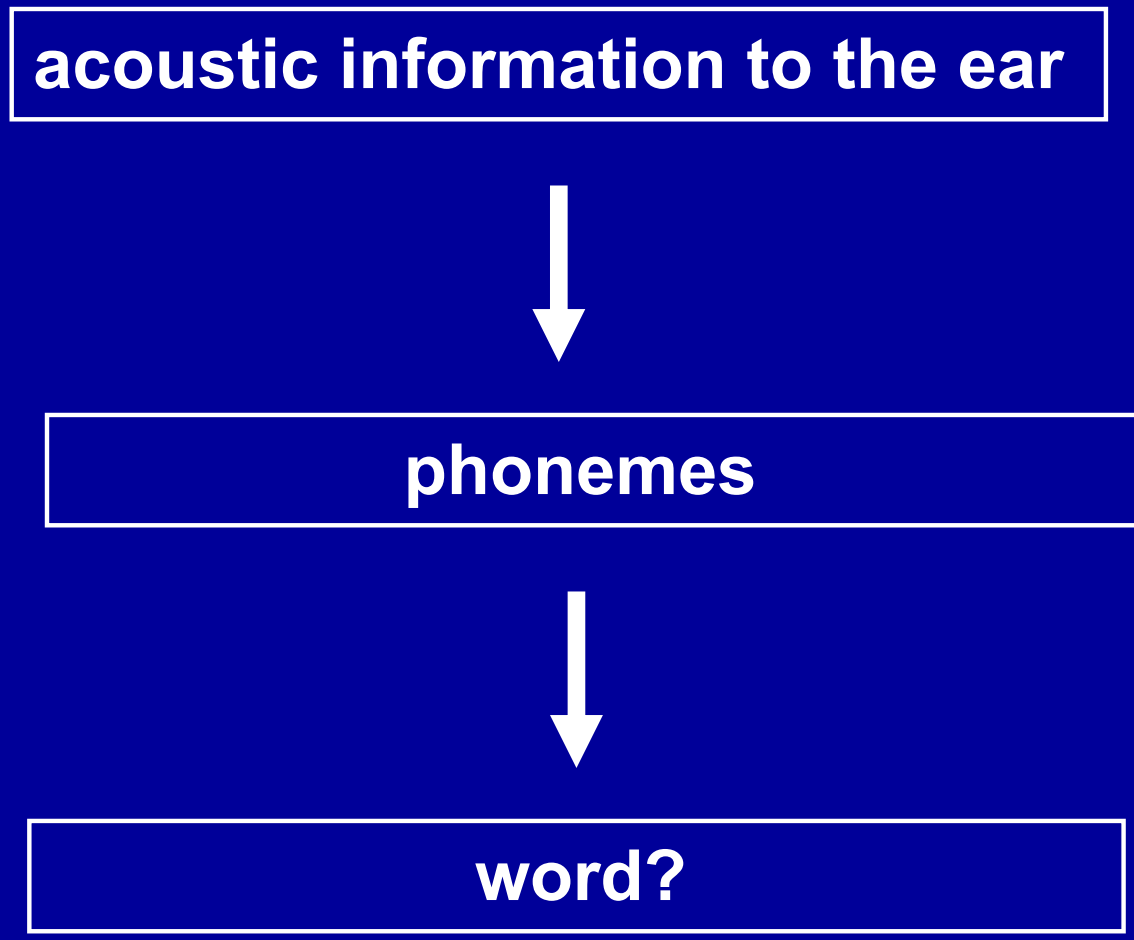
Discourse

Emotional Comprehension/Production

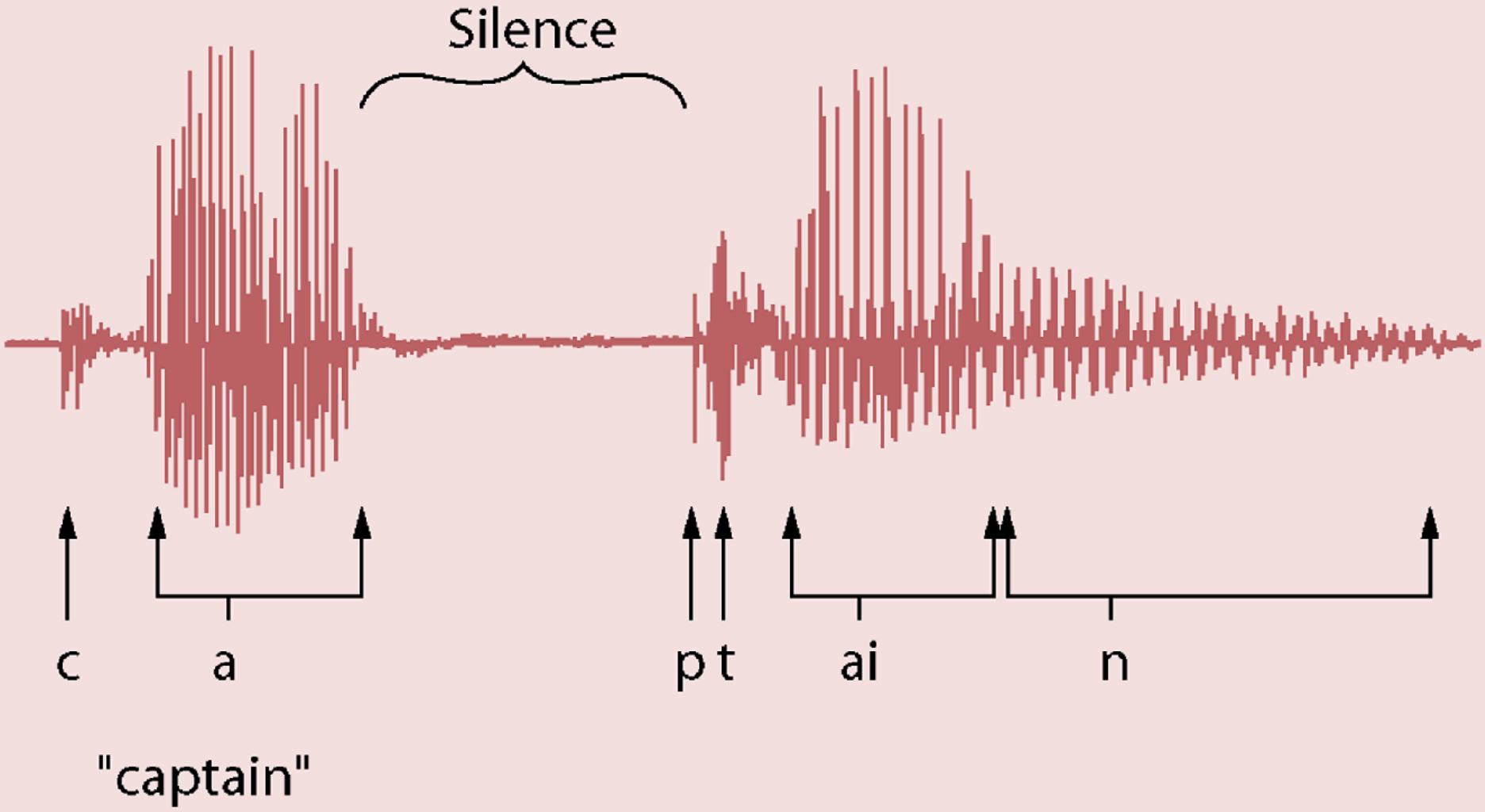
PHONOLOGY

- Phonemes are building blocks of speech sounds (*boy* vs. *toy)*
- Humans use 100 phonemes - 45 in English (26 letters; letters are not phonemes - "hot" and "cold")
- born to hear all phonemes - use or lose it in development after 6/8 months
- we can understand 250 words/min - normal rate is about 180 words/min = 14 phonemes/second in continuous stream

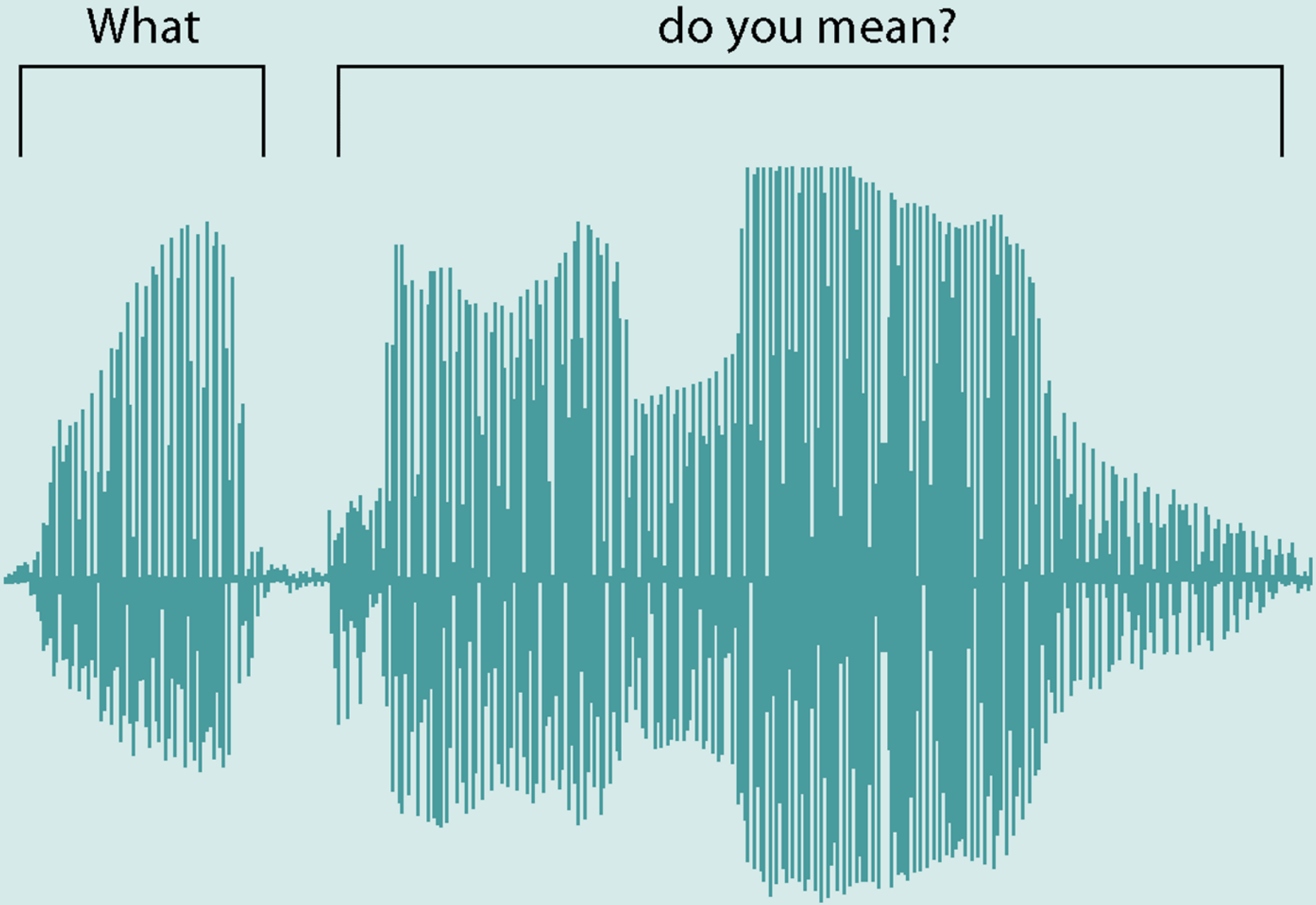
HEARING A WORD



Difference Between a Word and What you Hear

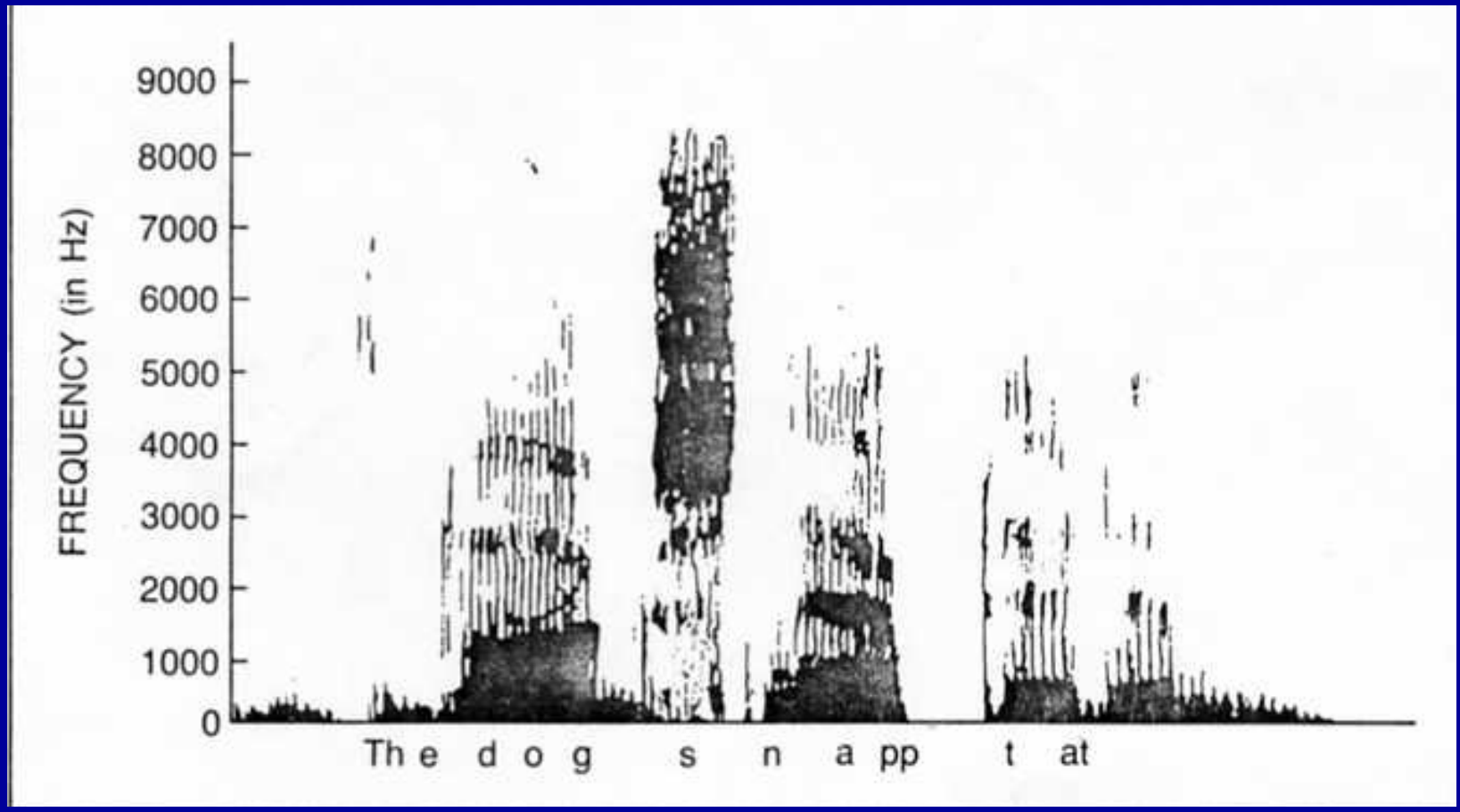


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The dog snapped at

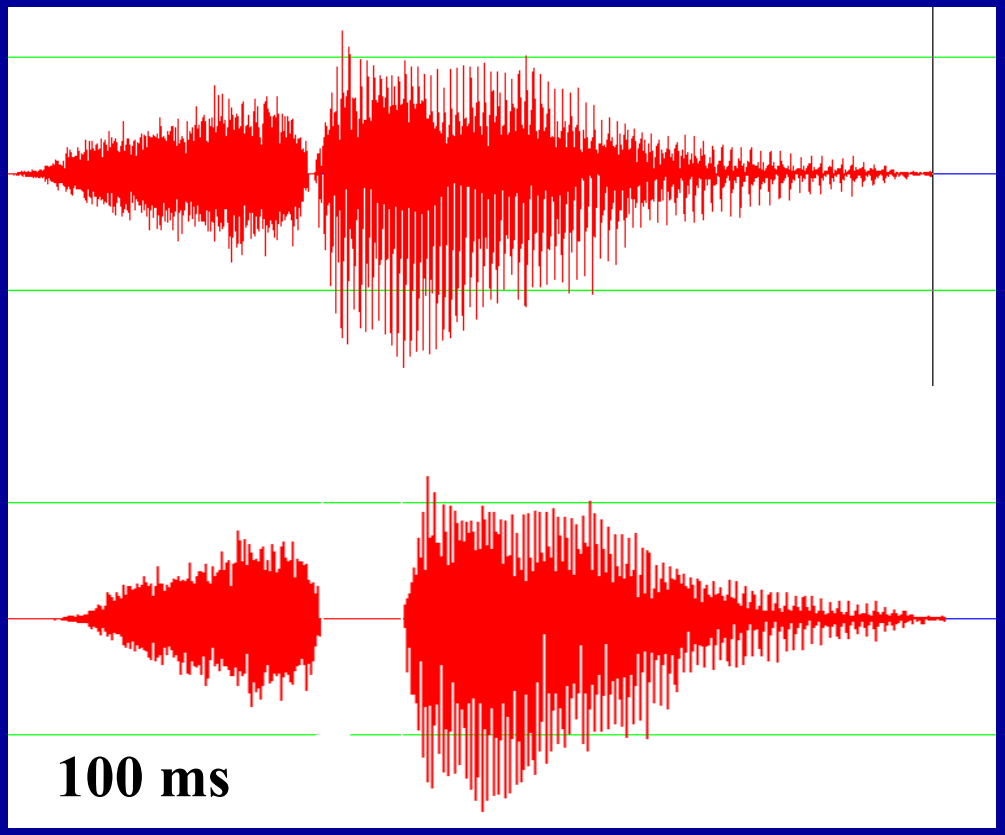


Spectrogram from sentence "John said that the dog snapped at him."

Note that the gaps between sounds generally occur within the words, rather than between words.

Source: Foss, D. J., and D. T. Hakes. *Psycholinguistics* (1978). © Pearson / Prentice Hall. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

For speech, 10's of milliseconds can change the meaning of a word



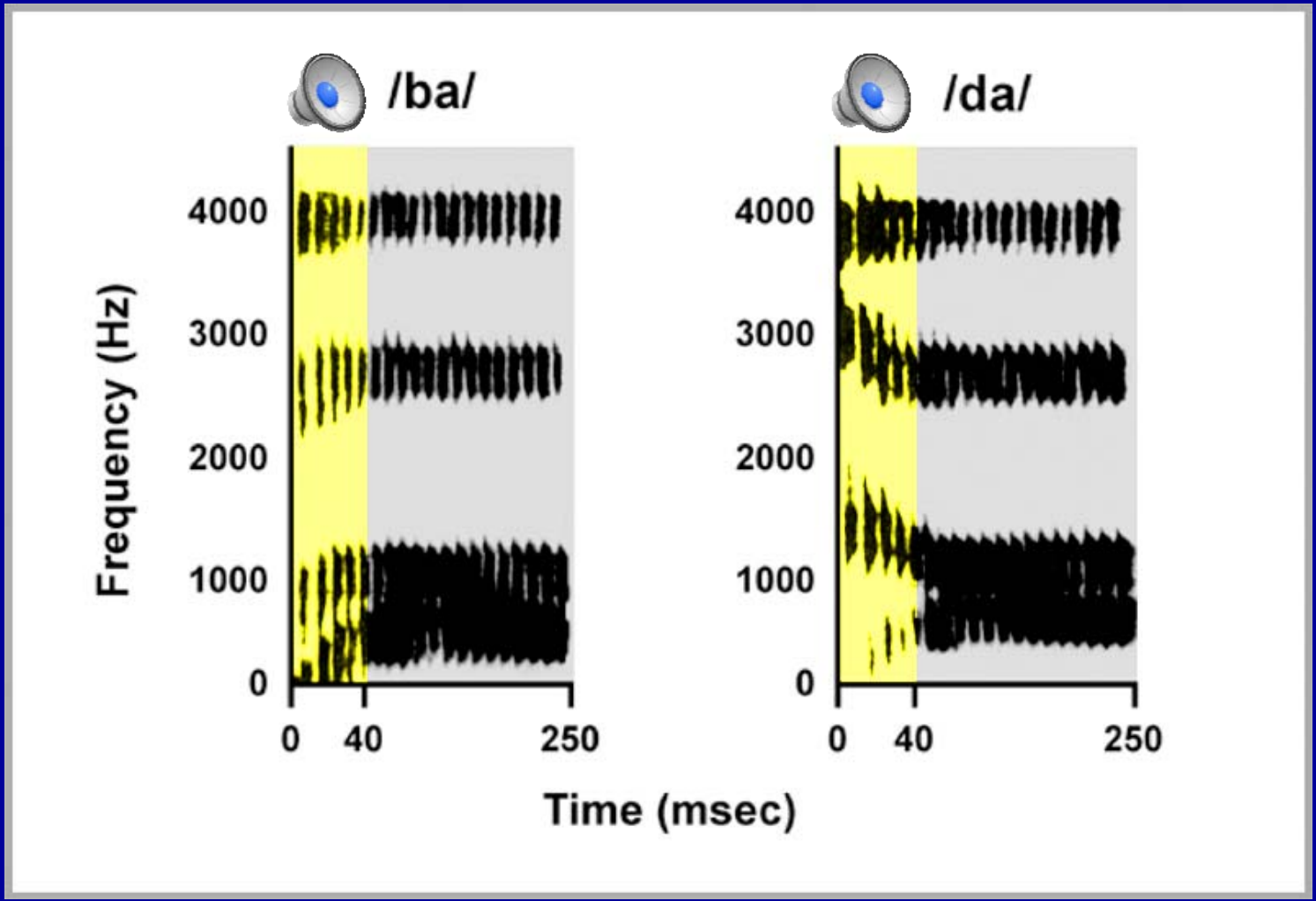
"say"

"stay"

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These waveforms are identical except for an inserted 100ms silent gap, yet we hear two different words.

10's of milliseconds can determine which syllable we hear



Many speech sounds (phonemes) differ only by brief spectral and/or temporal changes, specifically within 10's of milliseconds

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WHAT DO YOU HEAR?







WHAT DO YOU HEAR?



“little” from Mary saw the three little pigs in the corridor



“little” in isolation



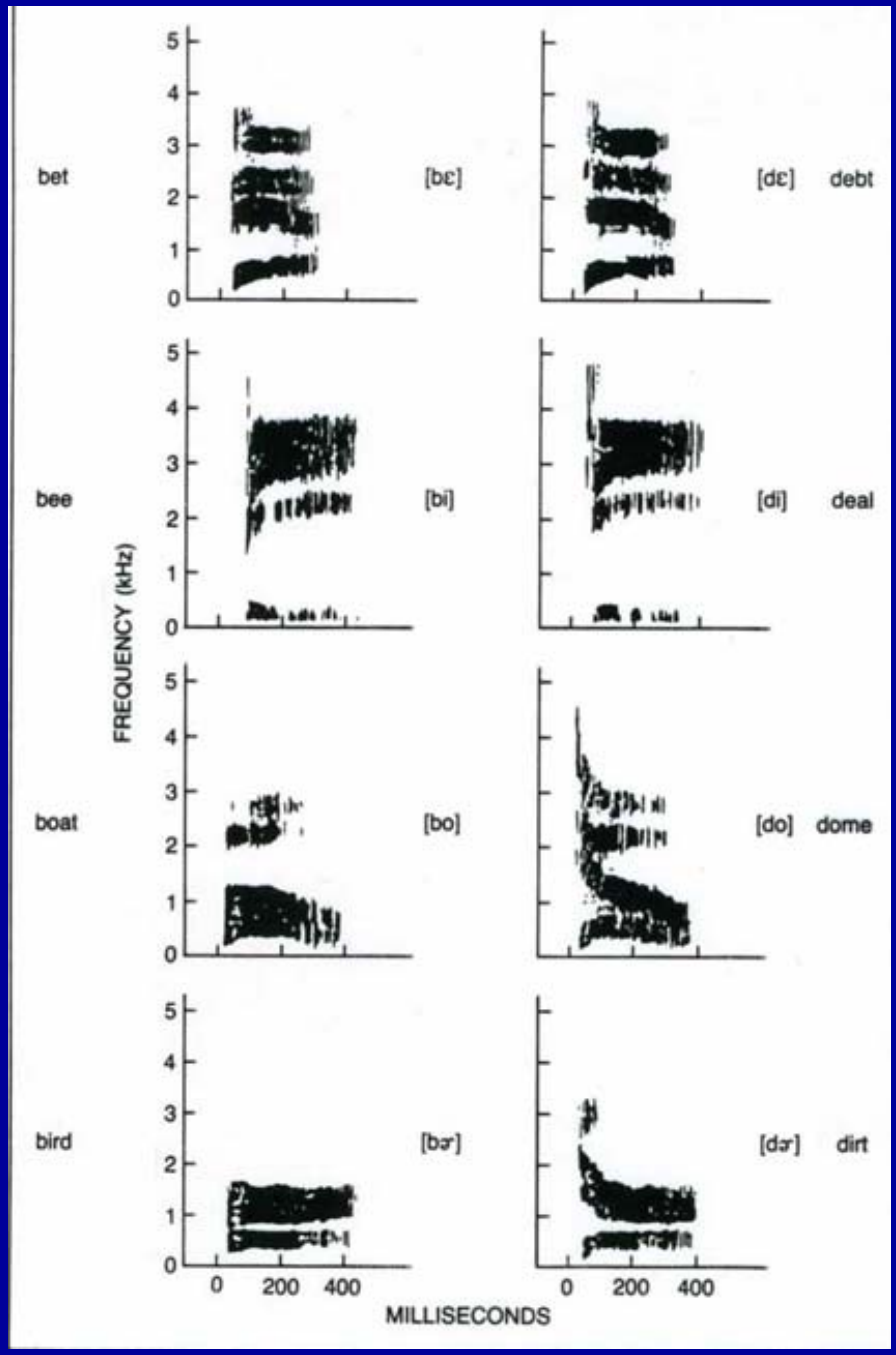
Mary saw the three little pigs in the corridor

Changes in the lead consonant are induced by the *following vowel*

problem of invariance

Spectrographs for /b/ and /d/ syllable families:

- The /b/ sounds in *bet* and *bird* are perceived similarly, yet spectrographs are quite different.
- The /b/ and /d/ sounds in *bet* and *debt* have similar spectrographs, but are perceived as different phonemes.



Source: Jusczyk, P. W., L. B. Smith, and C. Murphy. "The Perceptual Classification of Speech." *Attention, Perception, & Psychophysics* 30, no. 1 (1981): 10-23. © Springer. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

CATEGORICAL PERCEPTION

Many different sounds must be categorized into phonemes & words

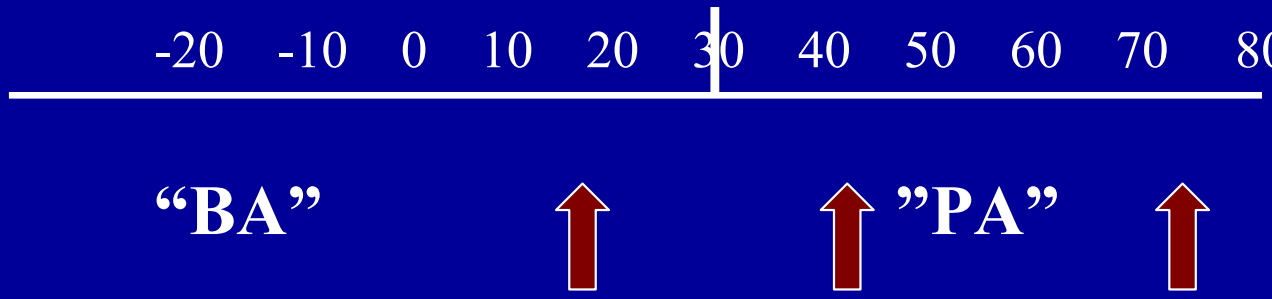
CATEGORICAL PERCEPTION

Categorical Perception

speech sounds vary *continuously*



… but we perceive them in *categories*



VOICE ONSET TIME (VOT)

- VOT = length of time from when a consonant is released to when voicing begins (vibration of vocal cords)
- negative VOT = vocal cords vibrate before stop is released

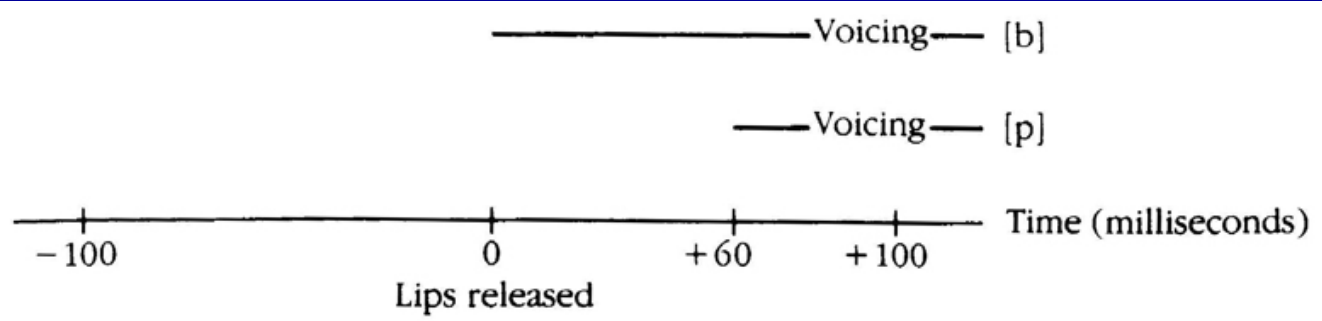


FIGURE 2.19: The difference between [b] and [p], the delay between the release of the lips and voicing in the case of [p]. (From *Psychology and language* by Herbert H. Clark and Eve E. Clark. Copyright by Harcourt Brace Jovanovich. Reproduced by permission of the publisher.)

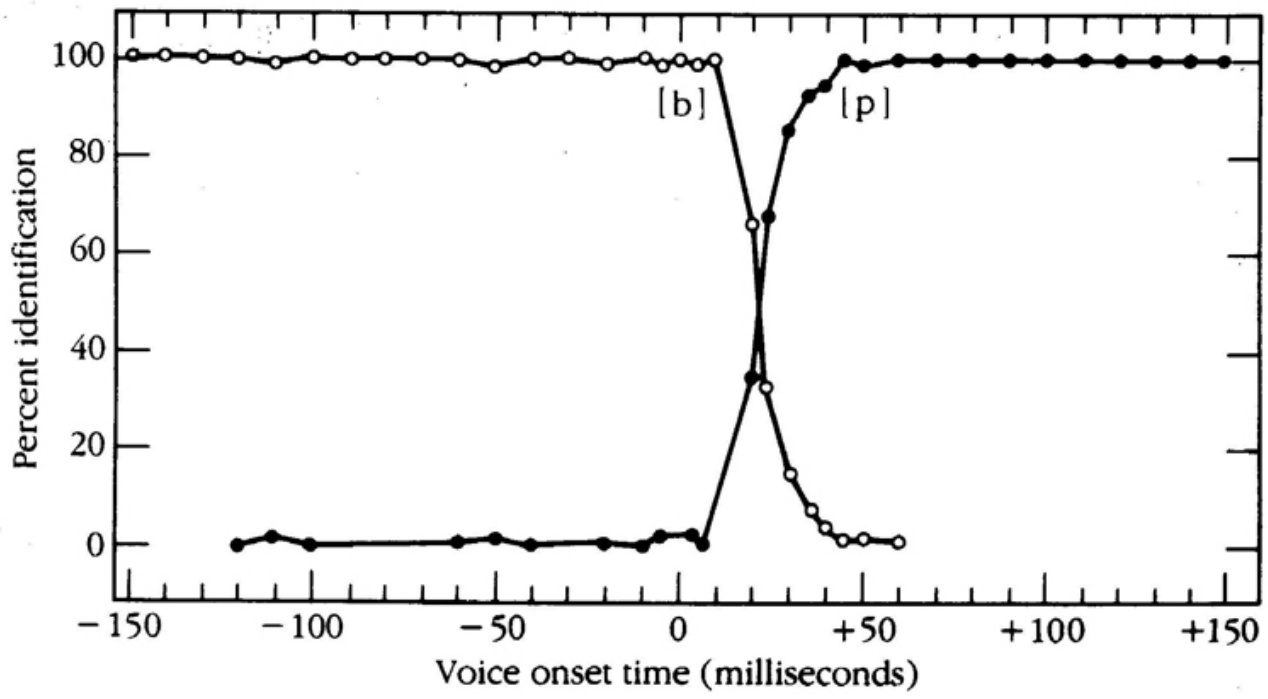


FIGURE 2.20: Percentage identification of [b] versus [p] as a function of voice-onset time. A sharp shift in these identification functions occurs at about 25 milliseconds. (From Lisker & Abramson, 1970.)

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SYNTAX

- structure of sentence
- “The model embraced the designer and the photographer ……”

“The model embraced the designer and the photographer laughed.”

SEMANTICS

- meaning of word or sentence
- *morphemes* are smallest unit of meaning

"Colorless green ideas sleep furiously."

"Fastly eat dinner, ballgame start soon."

Semantics/Syntax Interaction

The old man the boats

Semantics/Syntax Interaction

Jay Leno talked about sex with Lindsey Lohan

EVOKED RESPONSE POTENTIALS (ERPS)



Photo courtesy of squashpicker on Flickr.



- measures changes in electrical activity in msec
- uses surface electrodes placed on the scalp (16-100)
- signal requires a ***few hundred thousand*** *neurons to fire synchronously*
- measures time-locked averages (modest localization)

N400 to Semantic Incongruence

Image removed due to copyright restrictions.
See lecture video.

Reference: Figure 9.30 in Gazzaniga, M., R. Ivry, and G. Mangun. *Cognitive Neuroscience*. 2nd ed. W. W. Norton & Co., 2002.

N400 for semantic incongruence (“socks”); P650 for surprise (BIG FONT)

P600 to Syntactic Incongruence

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See lecture video.

Reference: Figure 9.32 in Gazzaniga, M., R. Ivry, and G. Mangun. *Cognitive Neuroscience*. 2nd ed. W. W. Norton & Co., 2002.

SPS = Syntactic Positivity Shift

PRAGMATICS

- practical understanding
- “Do you know what time it is?” “Yes”
- humor, sarcasm (“Two negatives make a positive, but two positives don’t make a negative.” “Yeah, yeah”)

COMPREHENSION OF AMBIGUOUS WORDS

“bugs”

SEMANTIC PRIMING IN LEXICAL DECISION

Lexical Decision Task

Real word?

DOCTOR
POCTOR
SPY
SYP

CHURCH



DOCTOR *slower*

NURSE



DOCTOR *faster*

COMPREHENSION OF AMBIGUOUS WORDS

hear

"Rumor has it that for years the government building had been plagued with problems. The man was not surprised when he found several spiders, roaches, and other bugs in the corner of his room."

After hearing "bugs" see for lexical decision either "ANT" or "SPY" or "SEW"

COMPREHENSION OF AMBIGUOUS WORDS

After hearing "bugs" see for lexical decision

Word	*Delay*	*Response*	*Delay*	*Response*
"ANT"	500 msec	- fast	2000 msec	- fast
"SPY"	500 msec	- fast	2000 msec	- slow
"SEW"	500 mses	- slow	2000 msec	- slow

Exhaustive lexical access **- all meanings are activated, correct one is maintained, incorrect one is suppressed**

PRAGMATICS

- practical understanding
- “Do you know what time it is?” “Yes”
- humor, sarcasm (“Two negatives make a positive, but two positives don’t make a negative.” “Yeah, yeah”)
- emotional intonation & right hemisphere



Public domain image.

SUPERIOR IDENTIFICATION OF LIES BY PATIENTS WITH LEFT HEMISPHERE LESIONS

Table 1 Success in interpreting lying cues

Group	*Vocal pitch cues only*	*Facial expression cues only*	*Facial and vocal cues*
LH	0.30	0.73	0.60
RH	0.20	0.50	0.45
C	0.20	0.57	0.47
UC	0.32	0.50	0.47

Values represent proportion correctly identifying liars. LH, left-hemisphere-damaged aphasics, mean age 58.4 years, patients at the Massachusetts General Hospital who gave informed consent. Their diagnoses, based on neurological examinations and MRI, were left middle cerebral artery infarct (nine patients) and subarachnoid haemorrhage (one subject). Neuropsychological testing revealed at least low average intellectual and perceptual abilities. Subjects achieved 95% correct (87.5–100% range) on a word-to-picture matching task and 89% correct on a lexical decision task (78–94% range)[9], indicating recognition of single words. However, they performed at near-chance levels on a sentence-to-picture matching task, with an average accuracy of 58% (53–69% range)[9], suggesting severely compromised comprehension of sentences. RH, right-hemisphere-damaged patients, mean age 59.6 years. C, matched controls, mean age 60.2 years. Both RH and C groups had equal numbers of men and women, were matched with the LH patients for education and IQ scores, were patients at the Massachusetts General Hospital, and had given informed consent. UC, undergraduate controls.

Reprinted by permission from Macmillan Publishers Ltd: Nature. Source: Etcoff, N. L., et al. "Lie Detection and Language Comprehension." *Nature* 405, no. 139 (2000): 139. © 2000.

The Neural Basis of Human Speech

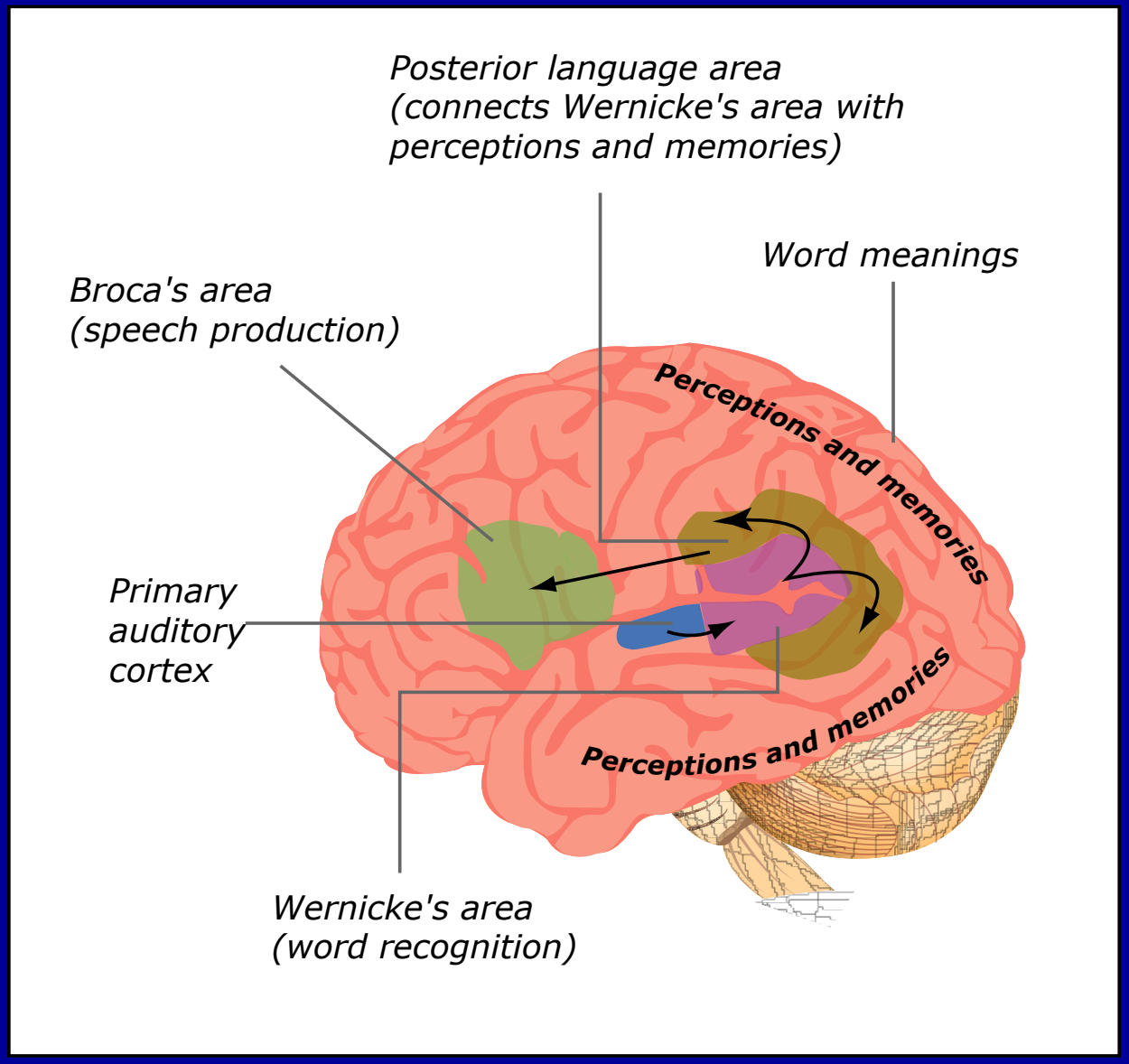


Image by MIT OpenCourseWare.

Broca's aphasia & Wernicke's aphasia

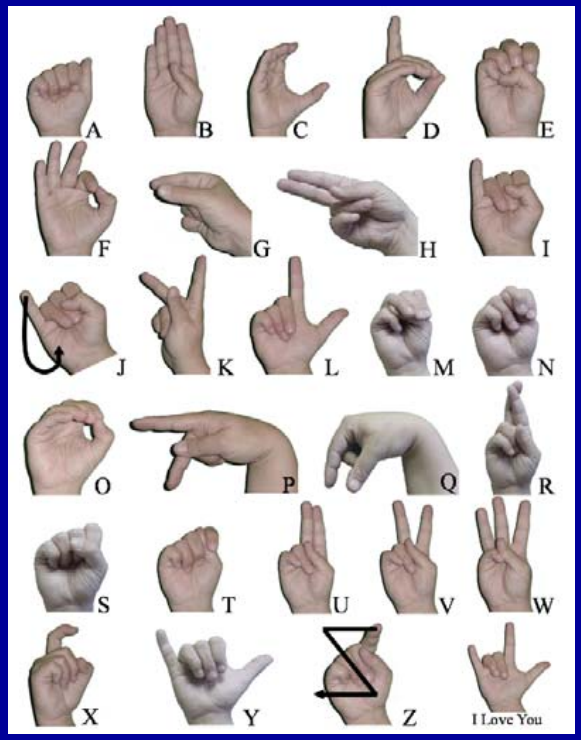
	Broca's	Wernicke's
Lesion	frontal	temporal
Speech	nonfluent, telegraphic	fluent, paraphasia, empty
Comprehension	good	poor

COOKIE-THEFT PICTURE

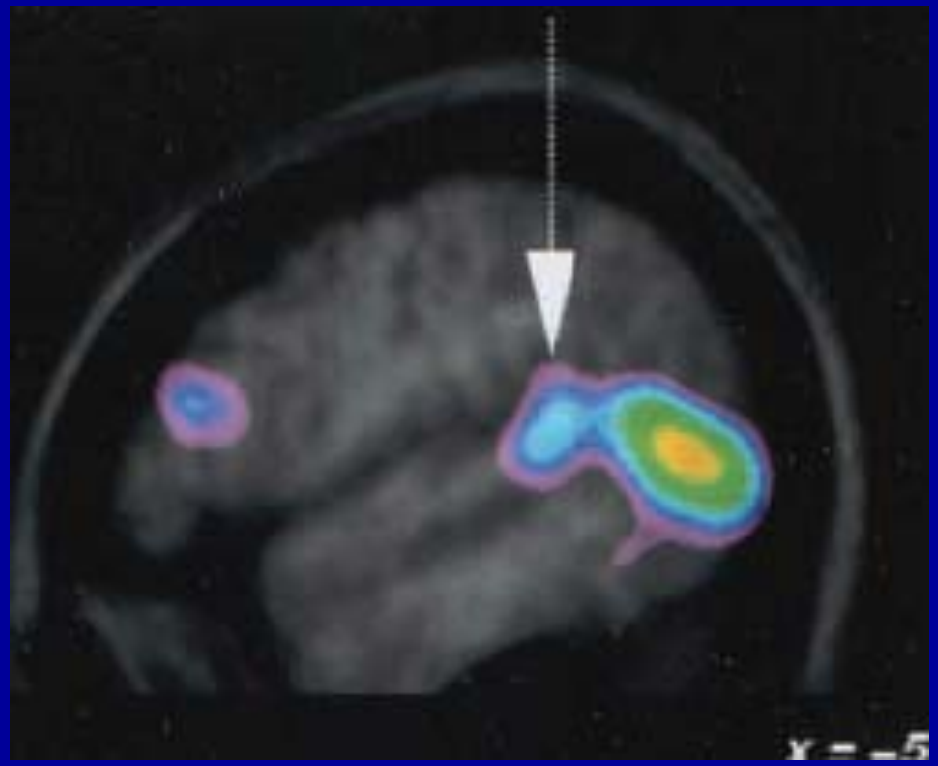


Source: Boston Diagnostic Aphasia Examination (BDAE). © Pearson. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Neural Basis of Language



Public domain image.



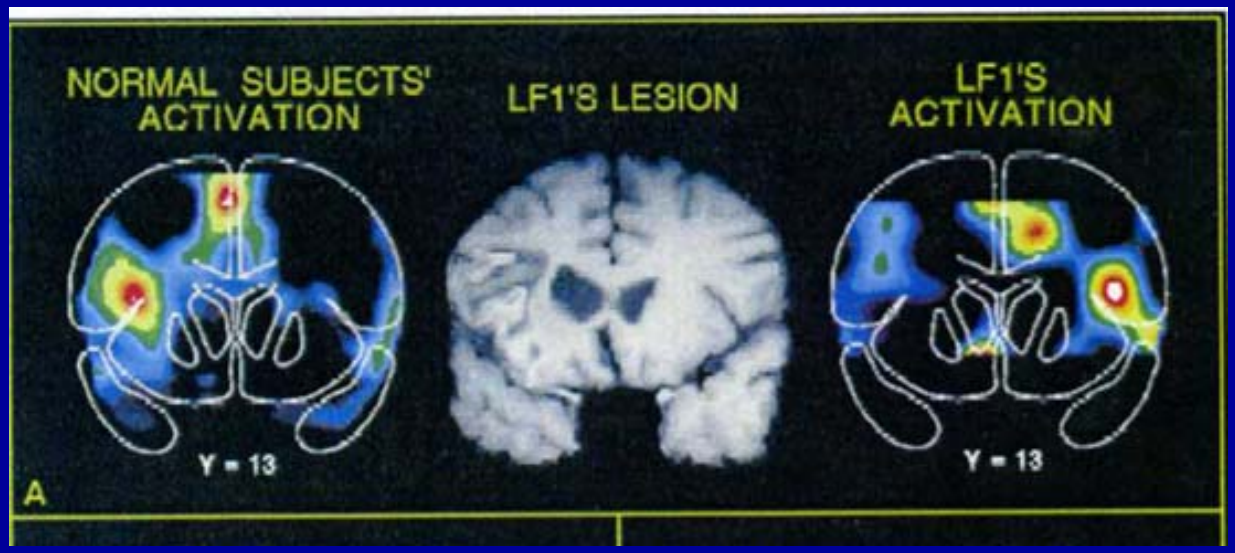
Courtesy of National Academy of Sciences, U.S.A. Used with permission.
Source: Petitto, L. A., et al. "Speech-Like Cerebral Activity in Profoundly Deaf People while Processing Signed Languages: Implications for the Neural Basis of Human Language." *PNAS* 97, no. 25 (2000): 13961-6.
© 2000 National Academy of Sciences, U.S.A.

Regardless of modality, sign & speech, recruit Wernicke & Broca regions;
Deaf infants "babble" with their hands
•• language is separable from speech

Petitto et al, PNAS (2000)

Recovery in Aphasia reflects right-hemisphere participation in language

- Case study – left frontal injury – word stem completion (name a word that starts with STA____) activates right frontal region, compared to normal left frontal region



Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Buckner, R. L., et al. "Preserved Speech Abilities and Compensation Following Prefrontal Damage." *PNAS* 93, no. 3 (1996): 1249-53. © 1996 National Academy of Sciences, U.S.A.

Language Acquisition



Photo courtesy of pohly on Flickr.

Major Milestones in Language Acquisition

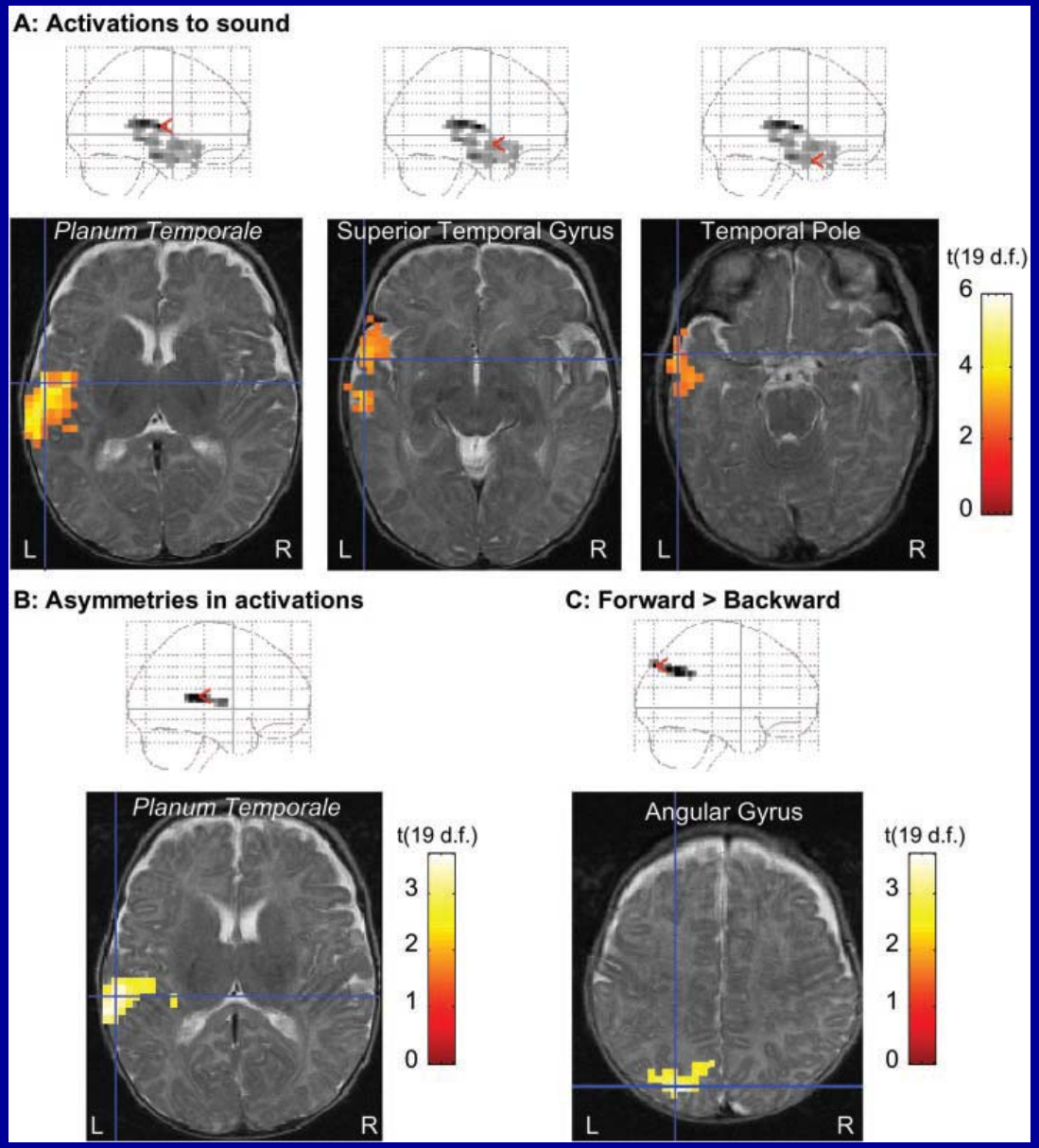
Approximate age	Major Linguistic Development
2-3 Months	Perceive all phonemes; notice changes in phonemes
6 Months	Ignore distinctions between sounds not used in languages spoken around them; babbling begins
8 Months	Identify words in the continuous speech stream
1 Year	Babbling has adultlike intonation patterns; speaking begins
13 Months	Understand about 50 words
18 Months	Speak about 50 words
2 Years	Telegraphic speech
3 Years	Simple pragmatics
4 Years	Rules of grammar, such as plural
6 Years	Know about 10,000 words
9 Years	Subtle pragmatics

Image by MIT OpenCourseWare.

INFANTS & LANGUAGE

- sucking on a nipple (rate)/habituation
- within 2 hours of birth, chose mother's voice over another voice (had not heard mother after birth)
- 3-day olds preferred language to other sounds like music
- 4-day olds noticed French/Dutch distinction
- 2 months phonemic distinctions (ba/ga), preference for own language

2-Day Old Infants Show Left Hemisphere Specialization for Speech



Dehaene-Lambertz, G., et al. "Functional Neuroimaging of Speech Perception in Infants." *Science* 298, no. 5600 (2002): 2013-5. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

MOTHERESE

- child-directed speech
- short, pauses, careful enunciation, exaggerated intonation in high pitch
- fits perfectly with infant perception



Photo courtesy of tomhe on Flickr.

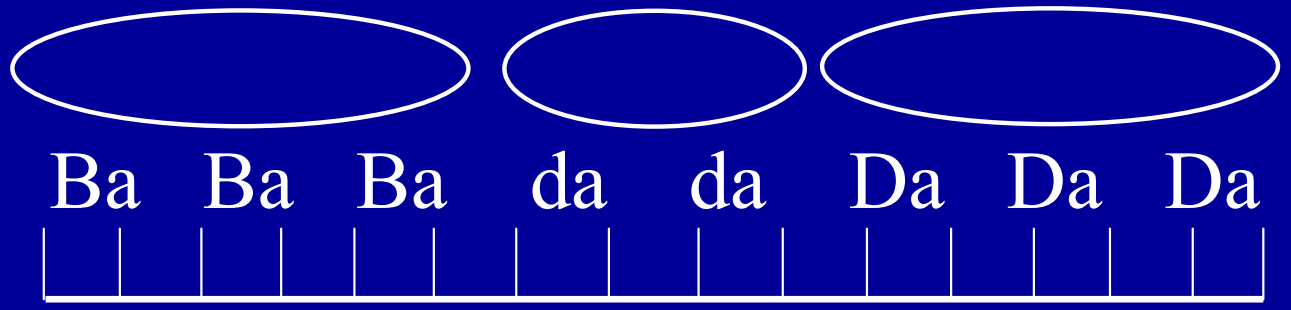
CATEGORICAL PERCEPTION

NON-NATIVE LANGUAGES

6-12 MONTHS (Werker & Lalonde 1988)



Eng Infants
10-12 mos
Eng Adults



Eng Infants
6-8 mos
Hindi Adults

16 Equal Steps from BA to DA

Categorical Perception

Phoneme categorical perception (e.g., ba/da)

Universal "learner" up to 8 months
Native "learner" = 12 months



Courtesy of Janet Werker. Used with permission.

Behavioral Evidence:
Head Turn Procedure
in Speech

http://www.youtube.com/watch?v=Ew5-xbc1HMk

Werker & Tees, 1992

Are Bilingual Children Delayed & Confused?

Babies “absorb” language easily!

BUT…. Isn’t 2 languages an overload?



Photo courtesy of pohly on Flickr.

THOUGHTS?

Bilingual Language Development

Language Delayed? NO!

Bilingual Groups - English/French, English/ASL, French/LSQ (ages 0-3) (Petitto & Kovelman, 2003; Petitto et al., 2001)

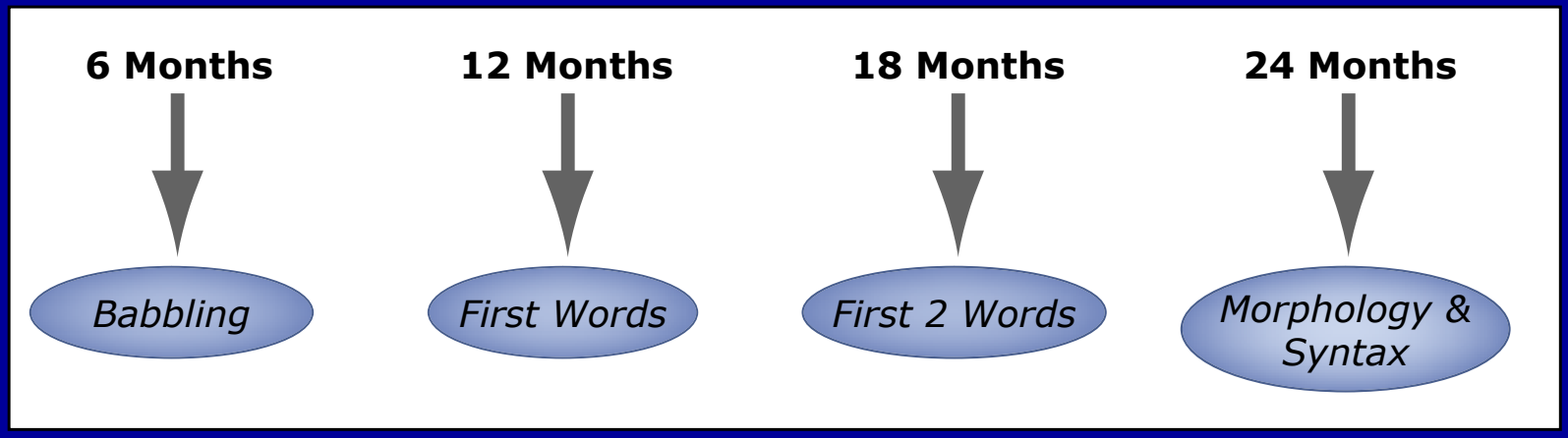


Image by MIT OpenCourseWare.

The Number of New Words Understood During the First Two Years of Life

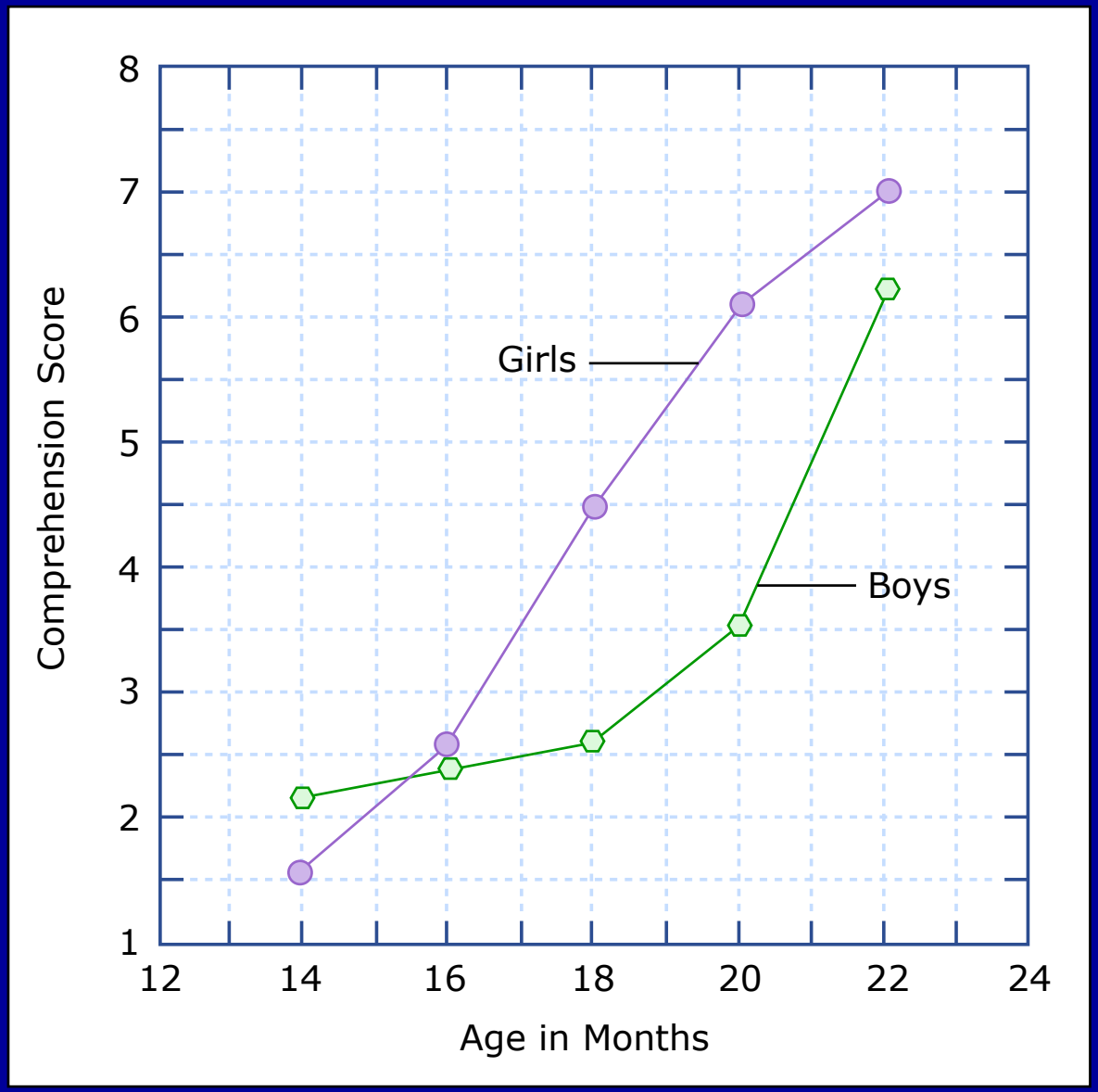


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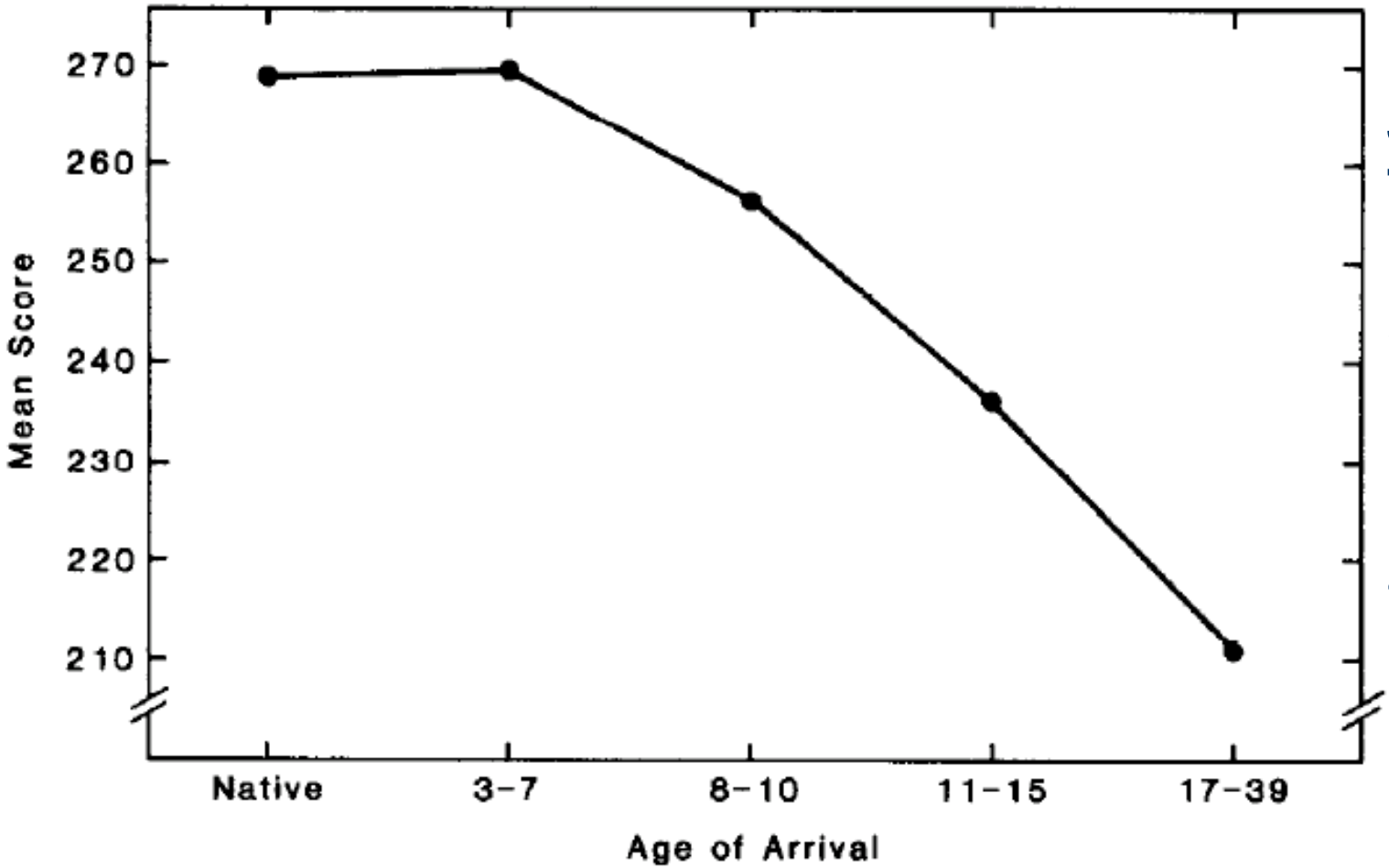
Critical Period in Language Acquisition

Fragile & Resilient aspects of language

FRAGILE **– phonology (production) & grammar**
- age sensitive

RESILIENT - semantics/vocabulary learning -
can be easily learned later in life

Critical Periods in Second Language



Grammaticality Judgment Task

He go home

Grammar is 'fragile' = age sensitive

FIG. 1. The relationship between age of arrival in the United States and total score correct on the test of English grammar.

Source: Johnson, J. S., et al. "Critical Period Effects in Second Language Learning: The Influence of Maturational State on the Acquisition of English as a Second Language." *Cognitive Psychology* 21 (1989): 60-99. Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

CRITICAL PERIOD?

Genie - locked in back room from 20 months until 13 years of age

Class watches 7:00 video clip from Secret of the Wild Child. PBS/NOVA, 1994.

1:30
36:30
46:40

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9.00SC Introduction to Psychology
Fall 2011

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THINKING

John Gabrieli 9.00

THINKING

7/8 divided by 3/4

How many square feet in a square yard?

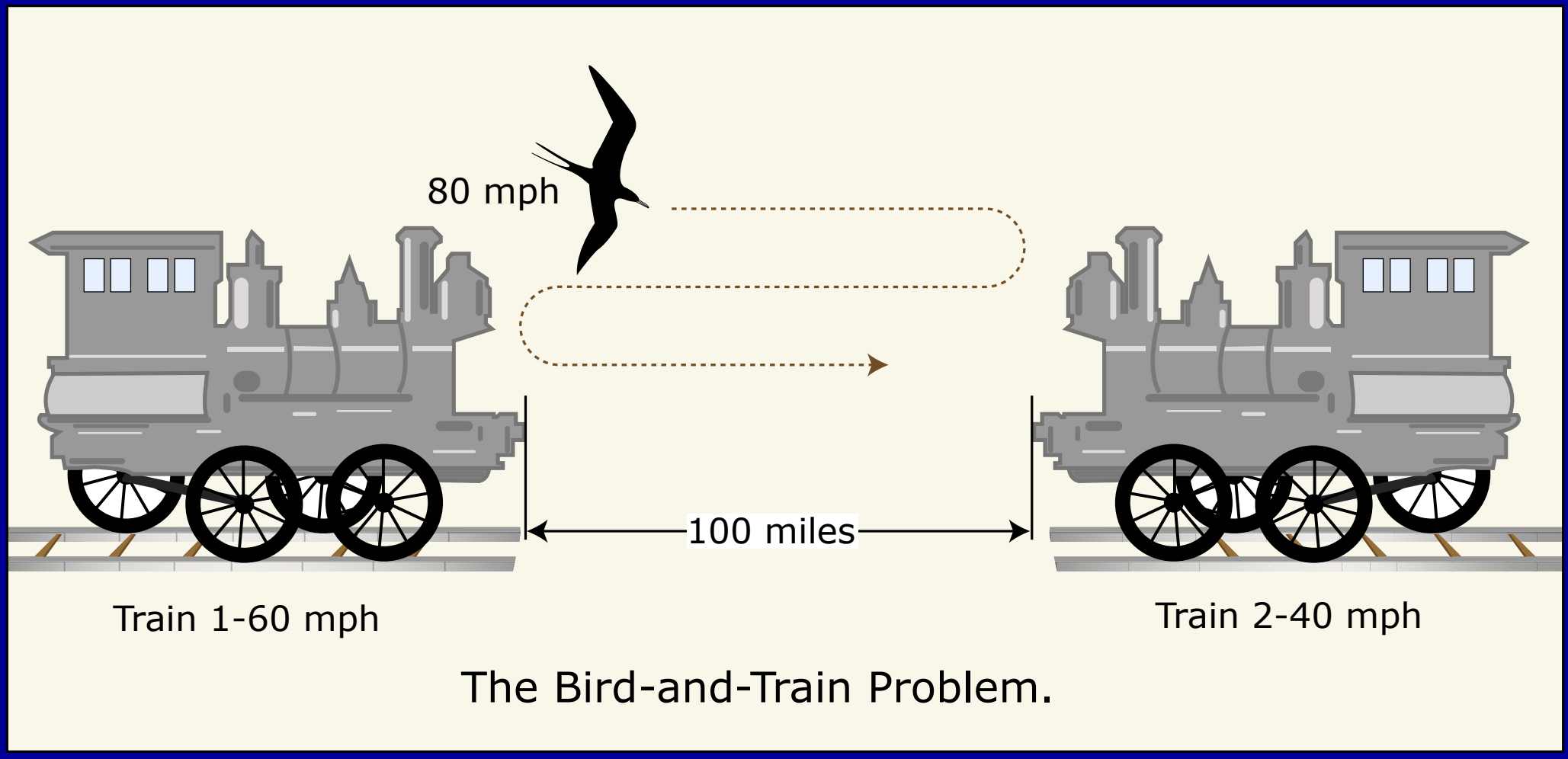
THINKING

A. Problem Solving

B. Judgment & Decision Making

C. Frontal Lobes & Thinking

Two train stations are 100 miles apart. At 2pm one Saturday afternoon the two trains start toward each other, one from each station. One train travels at 60 miles per hour, the other at 40 miles per hour. Just as the trains pull out of their stations, a bird springs into the air in front of the first train, and flies ahead to the front of the second train. When the bird reaches the second train, it turns back without losing any speed and flies directly toward the first train. The bird continues to fly back and forth between the trains at a rate of 80 miles per hour. How many miles will the bird have flown before the trains meet?



The Bird-and-Train Problem.

Image by MIT OpenCourseWare.

THINKING

1. Mental Set
 - functional fixedness
2. Overcoming Obstacles
 - restructuring
 - representation
 - analogy

In English, many words are pronounced somewhat differently from the way they are spelled.

OLK/OAK

Can you give me a synonym for PEOPLE or FAMILY that fits this pattern?

FOLK

Can you give me the name of an American President at the time of the Mexican War?

POLK

Can you give me a word that means egg white?

YOLK

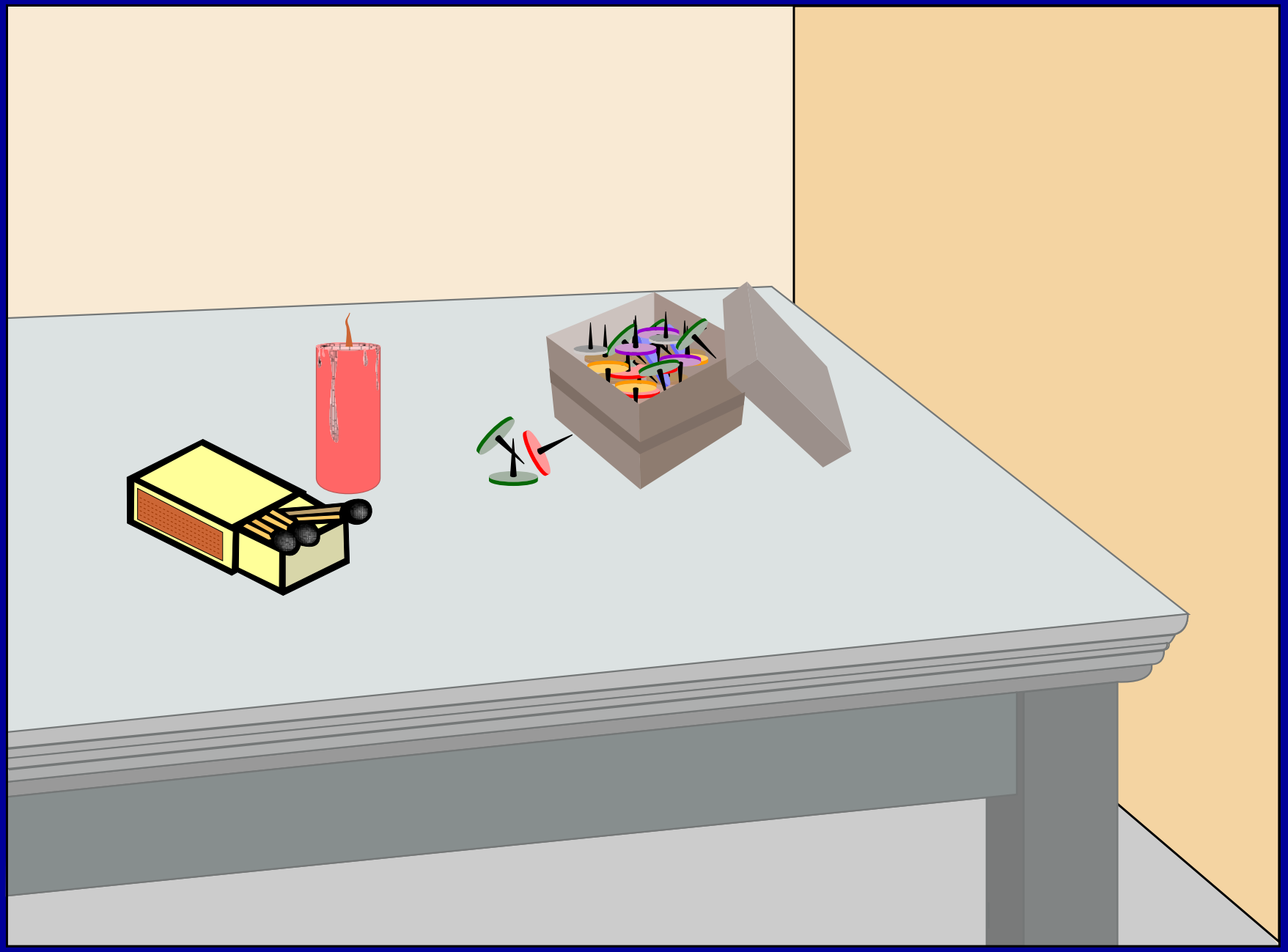
Goal: Tie strings together

39% in
10 minutes



Image by MIT OpenCourseWare.

Goal: Support a candle on the door



23% correct

Duncker, 1945

Image by MIT OpenCourseWare.

Goal: Support a candle on the door

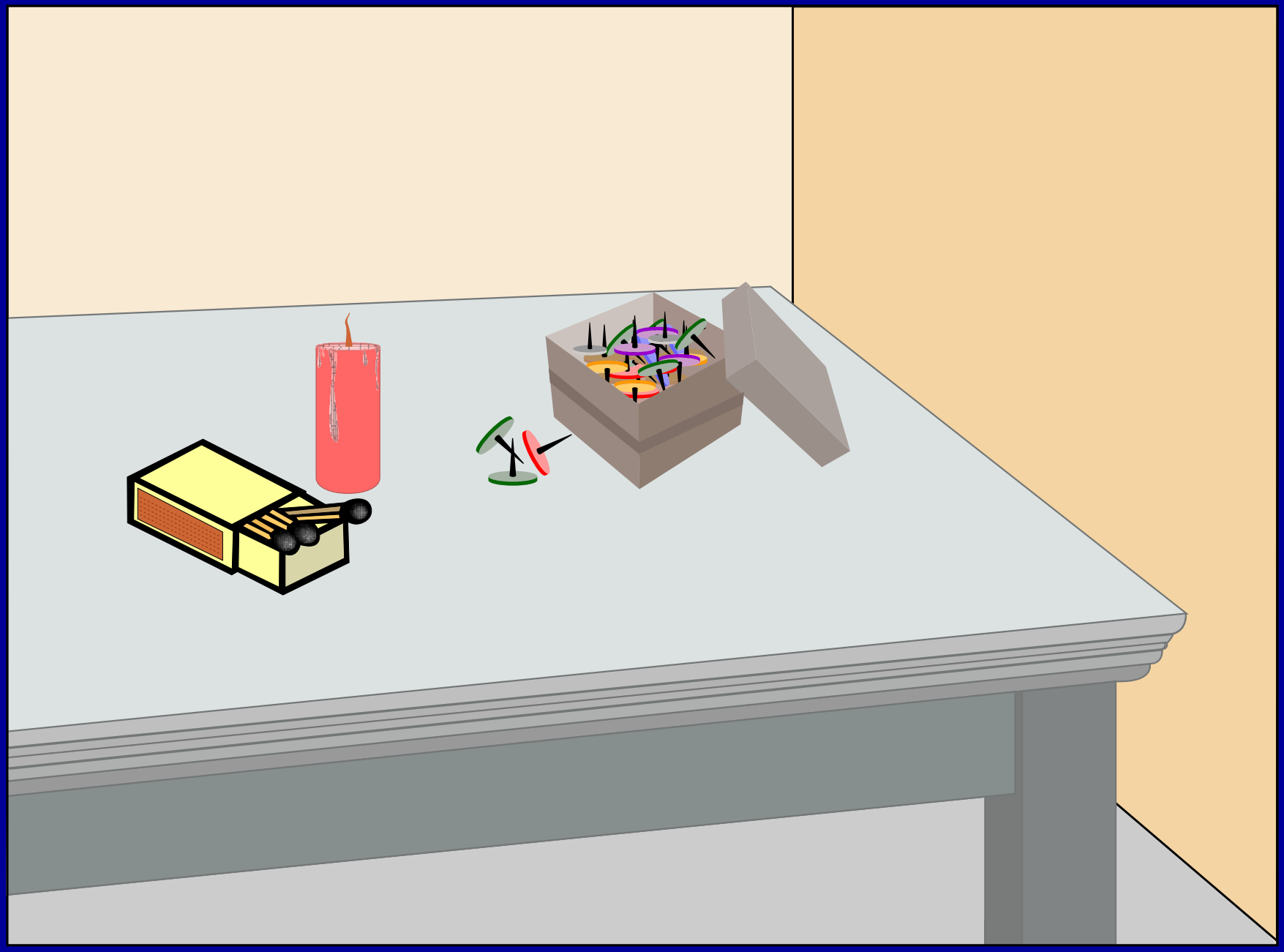
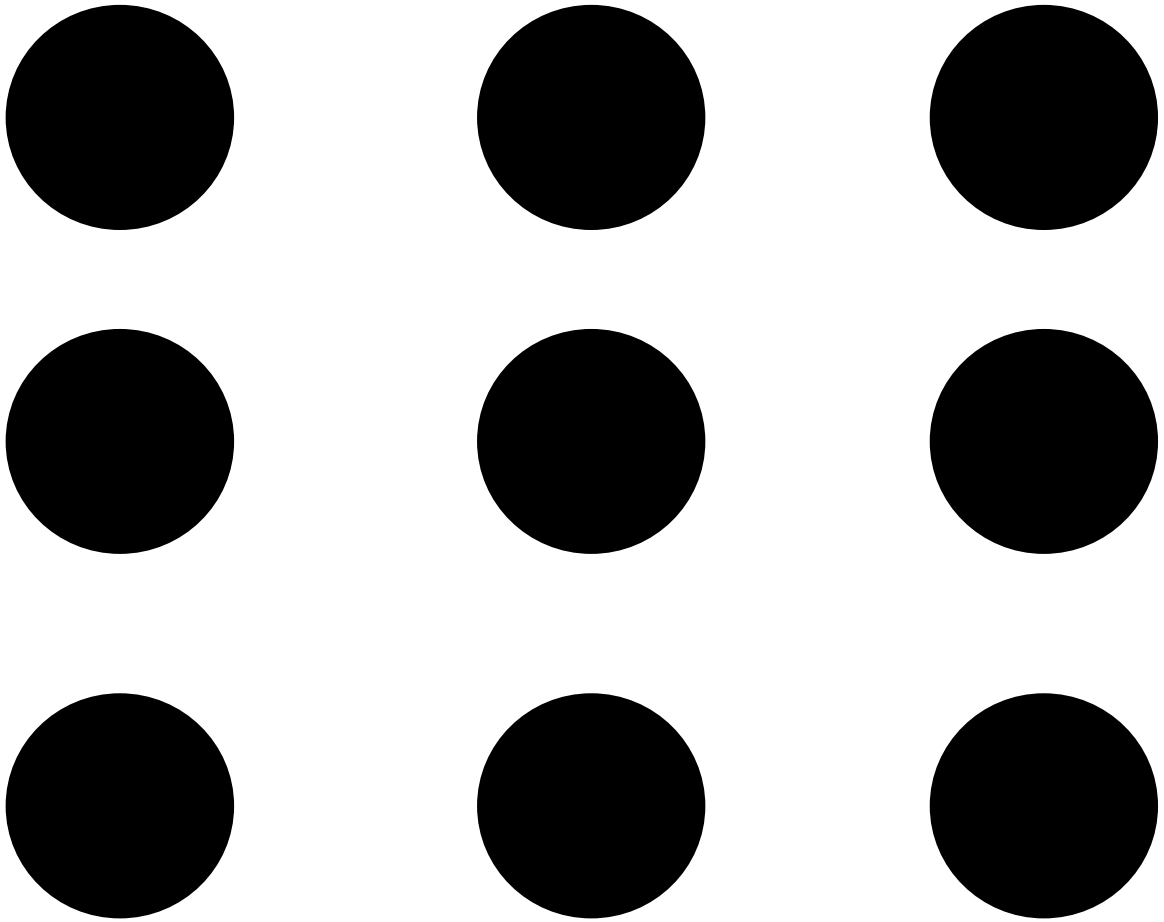


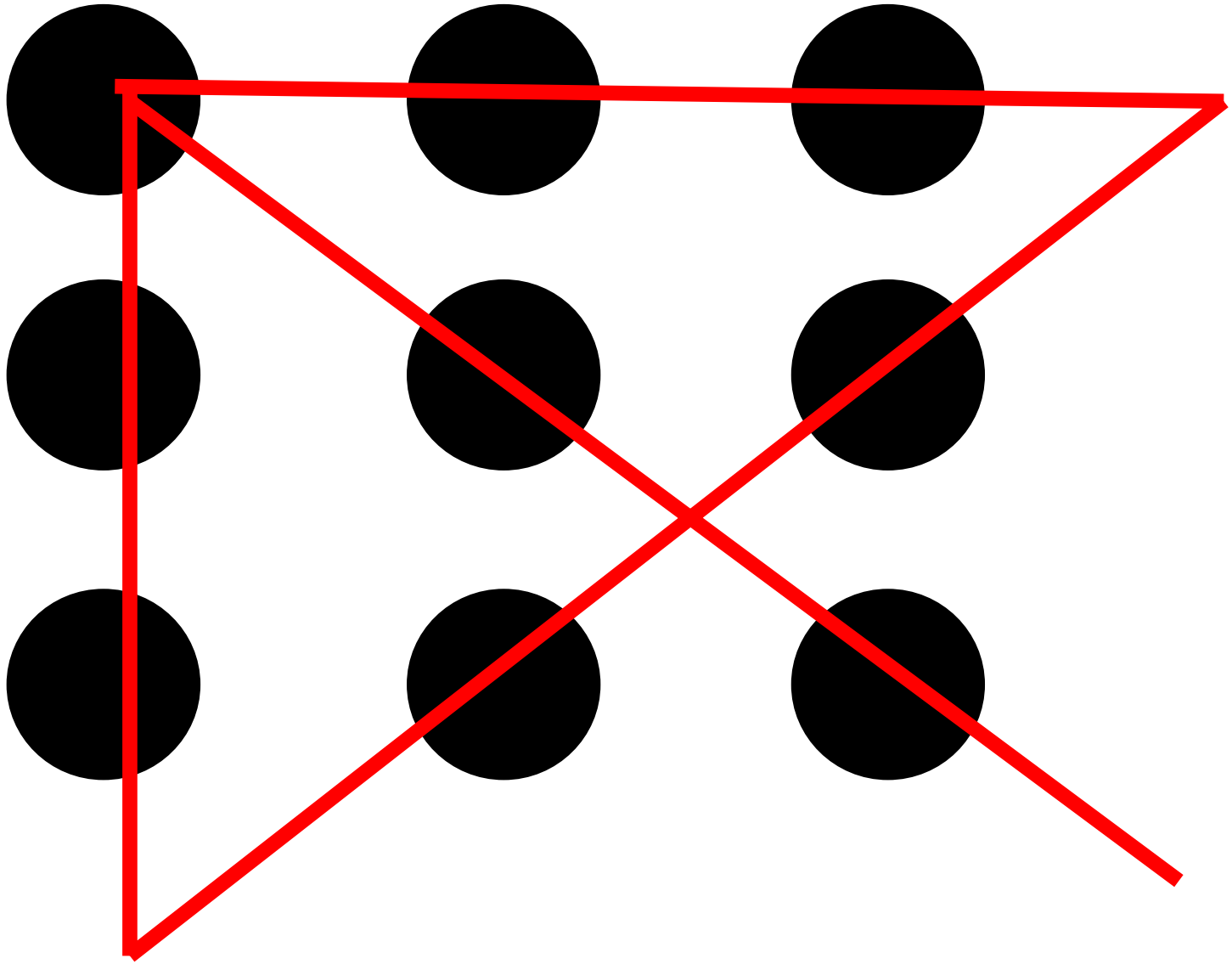
Image by MIT OpenCourseWare.

Duncker, 1945

Place tacks next to box?



Connect all the dots with 4 straight lines without lifting pencil



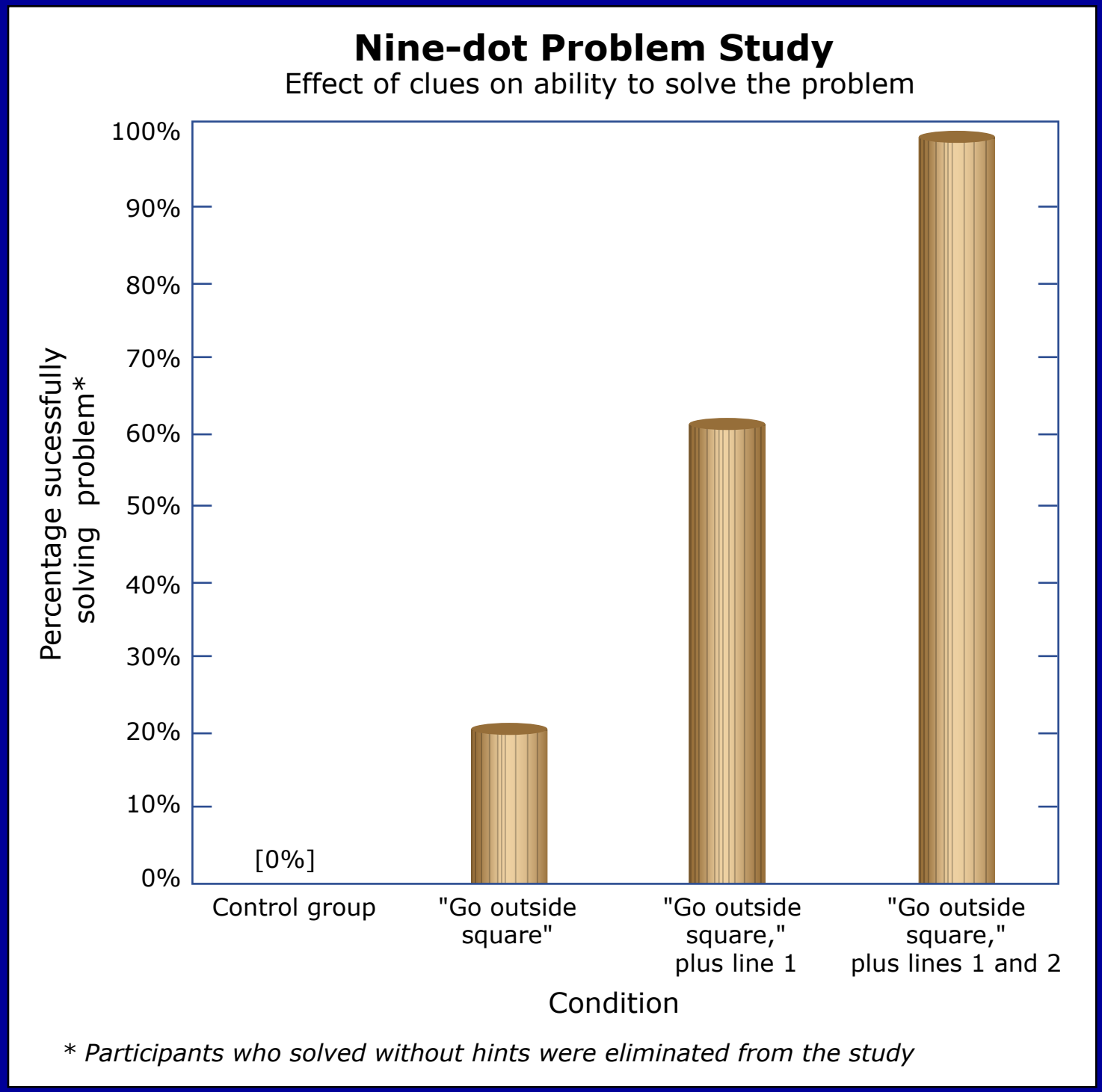


Image by MIT OpenCourseWare.

THINKING

1. Mental Set
 - functional fixedness
2. Overcoming Obstacles
 - restructuring
 - representation
 - analogy

Picture a large piece of paper, 1/100th of an inch thick. In your imagination, fold it once (now you have two layers), and continue folding it over on itself 50 times. It is true that it is impossible to fold any actual piece of paper 50 times. But for the sake of the problem imagine that you can. About how thick would the 50-times-folded paper be?

Adapted from Glass, A. L., and K. J. Holvoak. *Cognition*. Random House, 1985.

50 folds = 2^{50} = 1,100,000,000,000,000 = distance from earth to sun

Buddhist monk problem

One morning, exactly at sunrise, a Buddhist monk began to climb a tall mountain. A narrow path, no more than a foot or two wide, spiraled around the mountain to a glittering temple at the summit. The monk ascended at varying rates of speed, stopping many times along the way to rest and eat dried fruit he carried with him. He reached the temple shortly before sunset. After several days of fasting and meditation he began his journey back along the same path, starting at sunrise and again walking at variable speeds, with many pauses along the way. His average speed descending was, of course, greater than his average climbing speed. Show that there is a spot along the path that the monk will occupy on both trips at precisely the same time of day.

Problem by Carl Duncker, as cited in Arthur Koestler's *The Act of Creation* (Macmillan, 1964).

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A Graphic Representation of the Buddhist Monk Problem

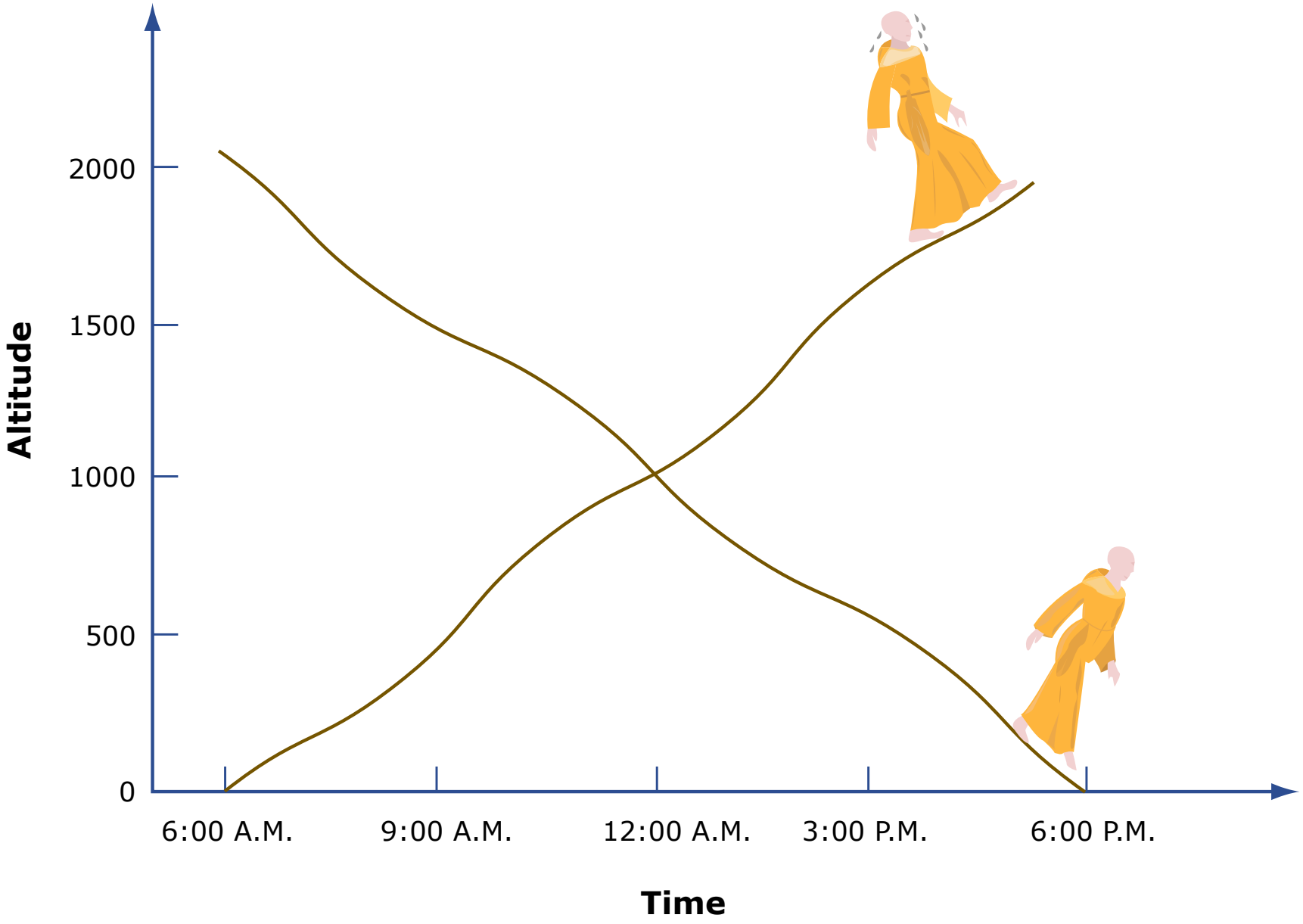


Image by MIT OpenCourseWare.

Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the tumor, but unless the tumor is destroyed the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays reach the tumor all at once at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this high intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities, the rays are harmless to healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue?

10% solve

Adapted from K. Duncker by Gick, M. L., and K. J. Holyoak in "Analogical problem solving." *Cognitive Psychology* 12, no. 3 (1980): 306-355.

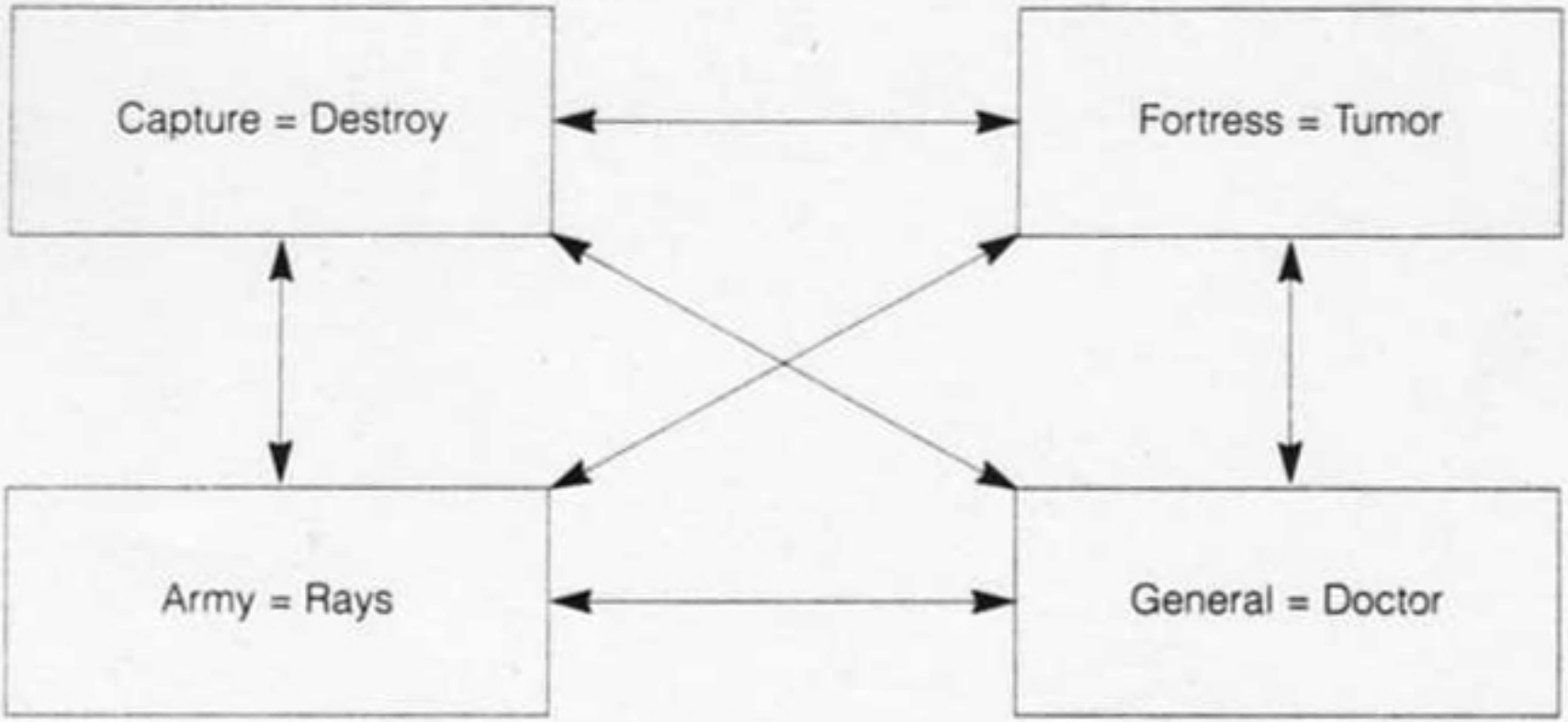
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A dictator ruled a small country from a fortress. The fortress was situated in the middle of the country and many roads radiated outward from it, like spokes on a wheel. A great general vowed to capture the fortress and free the country of the dictator. The general knew that if his entire army could attack the fortress at once it could be captured. But a spy reported that the dictator had planted mines on each of the roads. The mines were set so that small bodies of men could pass over them safely, since the dictator needed to be able to move troops and workers about, however, any large force would detonate the mines. Not only would this blow up the road, but the dictator would destroy many villages in retaliation. A full-scale direct attack on the fortress therefore seemed impossible.

The general, however, was undaunted. He divided his army up into small groups and dispatched each group to the head of a different road. When all was ready he gave the signal, and each group charged down a different road. All of the small groups passed safely over the mines, and the army then attacked the fortress in full strength. In this way the general was able to capture the fortress.

Gick, M. L., and K. J. Holyoak. "Analogical problem solving." *Cognitive Psychology* 12, no. 3 (1980): 306-355.

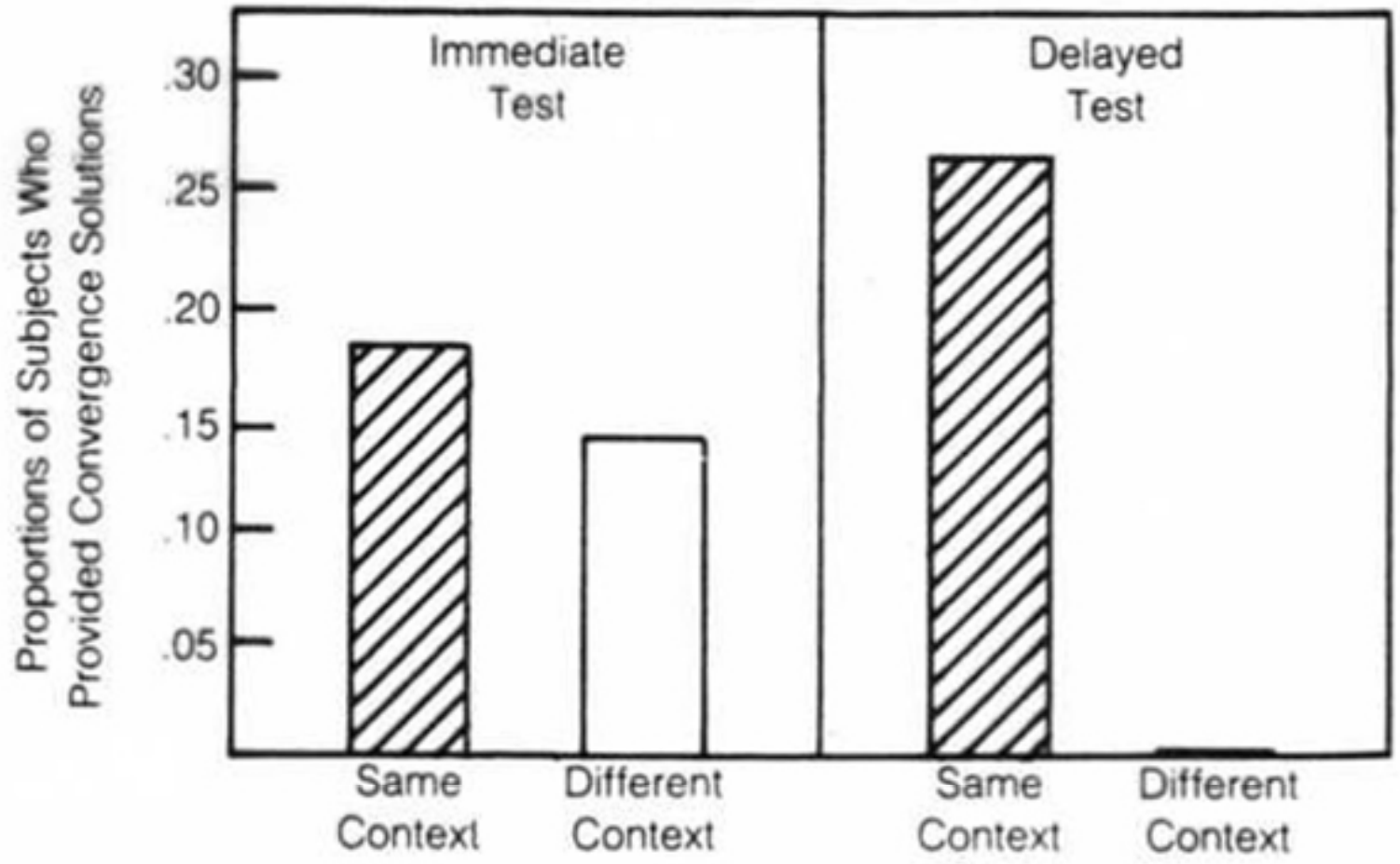
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An outline of Holyoak's model of analogical correspondences between the tumor problem and the fortress problem.

100% explicit transfer (warning)
35% implicit transfer (no warning)
structural vs. surface similarity

Source: Kantowitz, B., H. L. Roediger, and D. G. Elmes. *Experimental Psychology*. 7th edition. Cengage, 2001. © Cengage Learning. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.



Transfer when solving similar types of problems, as function of
(1) immediate vs. delayed after training problems
(2) same vs. different context
(Data from Spencer and Weisberg, 1986).

Source: Kantowitz, B., H. L. Roediger, and D. G. Elmes. *Experimental Psychology*. 7th edition. Cengage, 2001. © Cengage Learning. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

The instructors in a flight school adopted a policy of consistent positive reinforcement recommended by psychologists. They verbally reinforced each successful execution of a flight maneuver. After some experience with this training approach, the instructors claimed that contrary to psychological doctrine, high praise for good execution of complex maneuvers typically results in a decrement of performance on the next try.

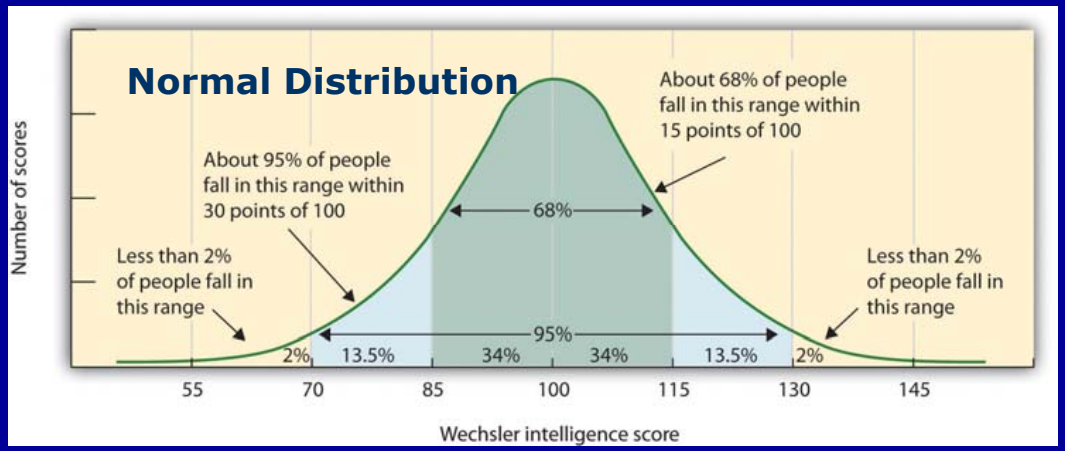
Are they correct?

Adapted from Kahneman, D., and A. Tversky. "On the psychology of prediction." *Psychological Review* 80, no. 4 (Jul 1973): 237-251.

Courtesy of American Psychological Association.

The instructors in a flight school adopted a policy of consistent positive reinforcement recommended by psychologists. They verbally reinforced each successful execution of a flight maneuver. After some experience with this training approach, the instructors claimed that contrary to psychological doctrine, high praise for good execution of complex maneuvers typically results in a decrement of performance on the next try. Are they correct?

regression to the mean



Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.

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Regression to the mean

Is there a hot hand in sports?

Judgment and Decision Making

Algorithms vs. heuristics

- representativeness •
- availability
- anchoring & adjustment
- framing

Suppose that you have a normal penny with a head (H) and a tail (T). You toss it six times. Which of these outcomes is most likely?

a) H H H H H H

b) H H H T T T

c) T H H T H T

d) can't tell

e) all the same

Suppose that you have a normal penny with a head (H) and a tail (T). You toss it six times. Which of these outcomes is most likely ?

a) H H H H H H

b) H H H T T T

c) T H H T H T

d) can't tell

e) all the same***

There are 30 people in a group. You get the month and date of each person's birthday. What is the approximate probability that two of the people will have the exact same birthday?

a) 90%

b) 70%

c) 50%

d) 30%

e) 10%

There are 30 people in a group. You get the month and date of each person's birthday. What is the approximate probability that two of the people will have the exact same birthday?

a) 90%

b) 70%***

c) 50%

d) 30%

e) 10%

Imagine a college in which the average height of men was 175 cm. You randomly measure the heights of 3 men. Which of these two outcomes is more likely:

A. John - 178 cm; Mike 170 cm; Bob 176 cm

B. John - 177 cm; Mike 177 cm; Bob 177 cm

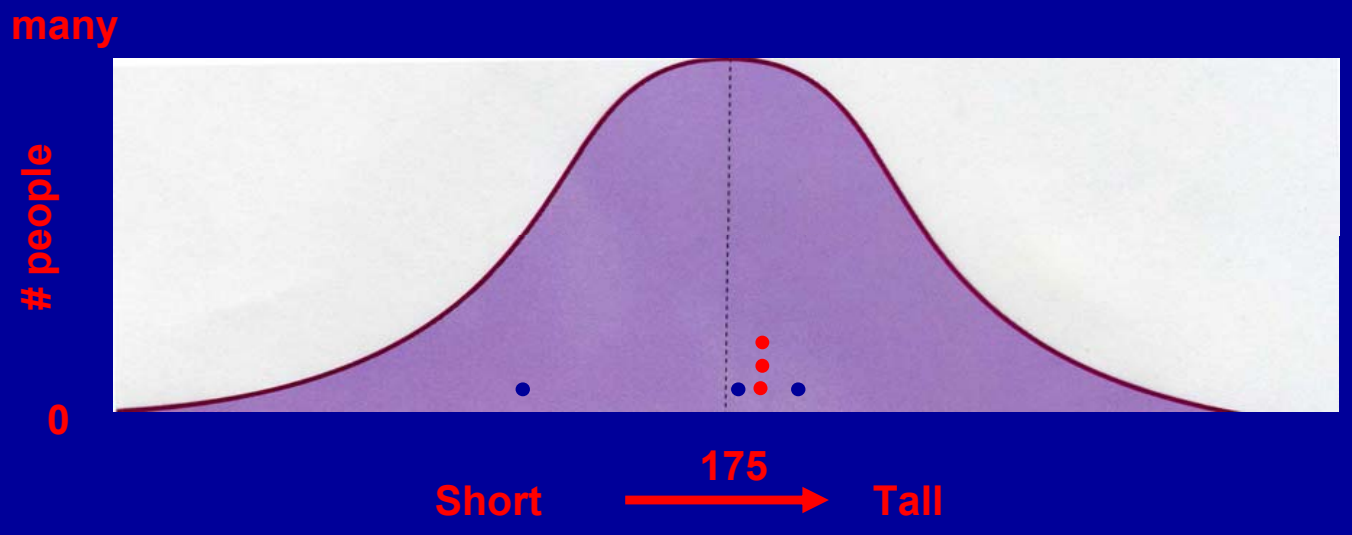
Imagine a college in which the average height of men was 175 cm. You randomly measure the heights of 3 men. Which of these two outcomes is more likely:

A. John - 178 cm; Mike 170 cm; Bob 176 cm **(selected by 178/188 subjects)**

3 cm

B. John - 177 cm; Mike 177 cm; Bob 177 cm *** **40% more likely**

2 cm



A nearby town is served by two hospitals. About 45 babies are born each day in the larger hospital. About 15 babies are born each day in the smaller hospital. Approximately 50% of all babies are boys (as you know). However, the exact percentage of babies who are boys will vary from day to day. Some days it may be higher than 50%, some days it may be lower. For a period of one year, both the larger hospital and the smaller hospital recorded the number of days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days?

A. **The larger hospital**
B. **The smaller hospital**
C. **About the same (within 5% of each other)**

Kahneman, D. and A. Tversky. "Subjective probability: A judgement of representativeness." *Cognitive Psychology* 3 (1972): 430-54.

Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

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A. The larger hospital

B. The smaller hospital

C. About the same (within 5% of each other)
most common answer

Law of Large Numbers vs. Law of small numbers

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Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations. Now rank the following options in terms of their likelihood in describing Linda. Give a ranking of 1 to the most likely option and a ranking of 8 to the least likely option:

a. _____ Linda is a teacher in elementary school
b. _____ Linda works in a bookstore and takes Yoga classes
c. _____ Linda is active in the feminist movement
d. _____ Linda is a psychiatric social worker
e. _____ Linda is a member of the League of Women Voters
f. _____ Linda is a bank teller
g. _____ Linda is an insurance salesperson
h. _____ Linda is a bank teller and is active in the feminist movement

Tversky, A., and D. Kahneman. "Extension Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment". *Psychological Review* 90, no. 4 (1983): 293–315. Published by American Psychological Association. Reprinted with permission.

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f. _____ Linda is a bank teller

h. _____ Linda is a bank teller and is active in the feminist movement

more likely – conjunction fallacy undergrads

first year grad students with a stats course

doctoral students in decision science program at business school

Tversky, A., and D. Kahneman. "Extension Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment". *Psychological Review* 90, no. 4 (1983): 293–315. Published by American Psychological Association. Reprinted with permission.

Judgment and Decision Making

Algorithms vs. heuristics

- representativeness
- availability •
- anchoring & adjustment
- framing

Some experts studied the frequency of appearance of various letters in the English language. The studied a typical passage in English and recorded the relative frequency with which various letters of the alphabet appeared in the first and the third positions in words. For example, in the word *language* , L appears in the first position and N appears in the third position. In this study, words with less than three letters were not examined. Consider the letter K.

Do you think that the letter K is more likely to appear in the first position or in the third position? Now estimate the ratio for the number of times in appeared in the first position in comparison to the number of times it appeared in the third position; if you guess 1:2, this means that it appeared in the third position twice as often as in the first position.

Your estimate: ___ : ___

Adapted from study by Mayzner and Tresselt (1965)

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Your estimate: 2 : 1

Really 1:2 kind vs. like

Adapted from study by Mayzner and Tresselt (1965)

More likely to drown in bathtub or die from terrorist attack in US?

	BRAIN TUMOR	
DIZZINESS	***Present***	***Absent***
Present	**160**	**40**
Absent	**40**	**10**

Is dizziness associated with having a brain tumor?

	BRAIN TUMOR	
DIZZINESS	***Present***	***Absent***
Present	**160**	**40**
Absent	**40**	**10**

Is dizziness associated with having a brain tumor?

Most say "yes" – answer is "no"

Pr of tumor given dizziness = 4:1; Pr without = 4:1

Imagine that XYZ syndrome is a serious condition that affects one person in 1,000. Imagine also that the test to diagnose the disease always indicates correctly that a person who has the XYZ virus actually has it. Finally, suppose that this test occasionally misidentifies a healthy individual as having XYZ. The test has a false positive rate of 5%, meaning that the test wrongly indicates that the XYZ virus is present in 5% of the cases where the person does not have the virus.

Choose a person at random, administer test, and person tests positive for XYZ syndrome. What is probability (0-100%) that the person really gas XYZ?

Stanovich, K. E. "Rational and Irrational Thought: The Thinking That IQ Tests Miss." *Scientific American Mind* 20 (2009): 34-39.

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Most common answer = 95%, wrong

1/1000 base rate; other 999 are tested, about 50 (.05 x 999) will be told they have XYZ; for every 51 who test positive, only 1 has it; answer = 1/51, about 2%.

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Judgment and Decision Making

Algorithms vs. heuristics

- representativeness
- availability
- anchoring & adjustment •
- framing

Estimate the answer to this multiplication problem (spend no more than 5 seconds doing the estimate)

8 x 7 x 6 x 5 x 4 x 3 x 2 x 1 = _____

or

1 x 2 x 3 x 4 X 5 x 6 X 7 X 8 = _____

Estimate the answer to this multiplication problem (spend no more than 5 seconds doing the estimate)

8 x 7 x 6 x 5 x 4 x 3 x 2 x 1 = 2250

or

1 x 2 x 3 x 4 X 5 x 6 X 7 X 8 = 512

40,320

How many African nations are there in the U.N.?

Wheel of fortune from 1 to 100

More or Less? How many?

wheel - 65 UN estimate 45

wheel - 10 UN estimate 25

Is the Mississippi River longer or shorter than 500 miles? How long is it actually, do you think?

or

Is the Mississippi River longer or shorter than 5000 miles? How long is it actually, do you think?

Is the Mississippi River longer or shorter than 500 miles? How long is it actually, do you think? 1000

or

Is the Mississippi River longer or shorter than 5000 miles? How long is it actually, do you think? 2000

2348 miles

Judgment and Decision Making

Algorithms vs. heuristics

- representativeness
- availability
- anchoring & adjustment
- framing •

Imagine that the United States is preparing for the outbreak of an unusual South American disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a one-third probability that 600 people will be saved, and a two-thirds probability that no people will be saved.

Which Program do you favor?

Adapted from Tversky, A., and D. Kahneman. "The framing of decisions and the psychology of choice." *Science* 211, no. 4481 (1981): 453-458.

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Imagine that the United States is preparing for the outbreak of an unusual South American disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

If Program A is adopted, 400 people will die.

If Program B is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.

Which Program do you favor?

Adapted from Tversky, A., and D. Kahneman. "The framing of decisions and the psychology of choice." *Science* 211, no. 4481 (1981): 453-458.

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If Program A is adopted, 200 people will be saved. ***(72%) - Lives saved***

If Program B is adopted, there is a one-third probability that 600 people will be saved, and a two-thirds probability that no people will be saved.

Which Program do you favor?

If Program A is adopted, 400 people will die. ***(22%) - Lives lost***

If Program B is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.

Which Program do you favor?

Would you rather have

(a) a sure gain of $75 *or*

(b) a lottery with 75% chance of winning $100 and 25% chance of winning nothing at all

or

(a) a sure loss of $75 *or*

(b) a lottery with 75% chance of losing $100 and 25% chance of losing nothing at all

Would you rather have

84%** (a) a sure gain of $75 *or

(b) a lottery with 75% chance of winning $100 and 25% chance of winning nothing at all

(a) a sure loss of $75 *or*

***87%** (b) a lottery with 75% chance of losing $100 and 25% chance of losing nothing at all**

risk averse for gains

risk taking for losses

Jack is looking at Anne, but Anne is looking at George. Jack is married, but George is not. Is a married person looking at an unmarried person?

A) Yes

B) No

C) Cannot be determined

Jack is looking at Anne, but Anne is looking at George. Jack is married, but George is not. Is a married person looking at an unmarried person?

A) Yes**

B) No

C) Cannot be determined (>80%)

Anne – marital status unknown
If married (A), she is looking at unmarried George
If unmarried (A), married Jack looking at unmarried Anne.
FULLY DISJUNCTIVE REASONING – all possibilities

A bat and a ball cost $1.10 in total. The bat costs $1 more than the ball. How much does the ball cost?

A bat and a ball cost $1.10 in total. The bat costs $1 more than the ball. How much does the ball cost?

10 cents most common answer

But then bat would have to cost $1.10 and total would be $1.20.

Imagine that the U.S. Department of Transportation has found that a particular German car is eight times more likely than a typical family car to kill occupants of another car in a crash. The federal government is considering restricting sale and use of this German car. Do you think sales of the German car should be banned in the U.S.? Do you think the German car should be banned from being driven on US streets?

Stanovich, K. E. "Rational and Irrational Thought: The Thinking That IQ Tests Miss." *Scientific American Mind* 20 (2009): 34-39.)

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Imagine that the U.S. Department of Transportation has found that the Ford Explorer is eight times more likely than a typical family car to kill occupants of another car in a crash. The German government is considering restricting sale and use of the Ford Explorer. Do you think sales of the Ford Explorer should be banned in the Germany? Do you think the Ford Explorer should be banned from being driven on German streets?

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Stanovich, K. E. "Rational and Irrational Thought: The Thinking That IQ Tests Miss." *Scientific American Mind* 20 (2009): 34-39.)

American subjects

- German car, off the streets in U.S. – 73.7%
- American car, off the streets in Germany – 39.2%

PERSPECTIVE

FRONTAL LOBES & THINKING

Frontal Lobes

1. Primary and Premotor areas
2. Orbitofrontal (desires)
3. Dorsolateral (decisions)

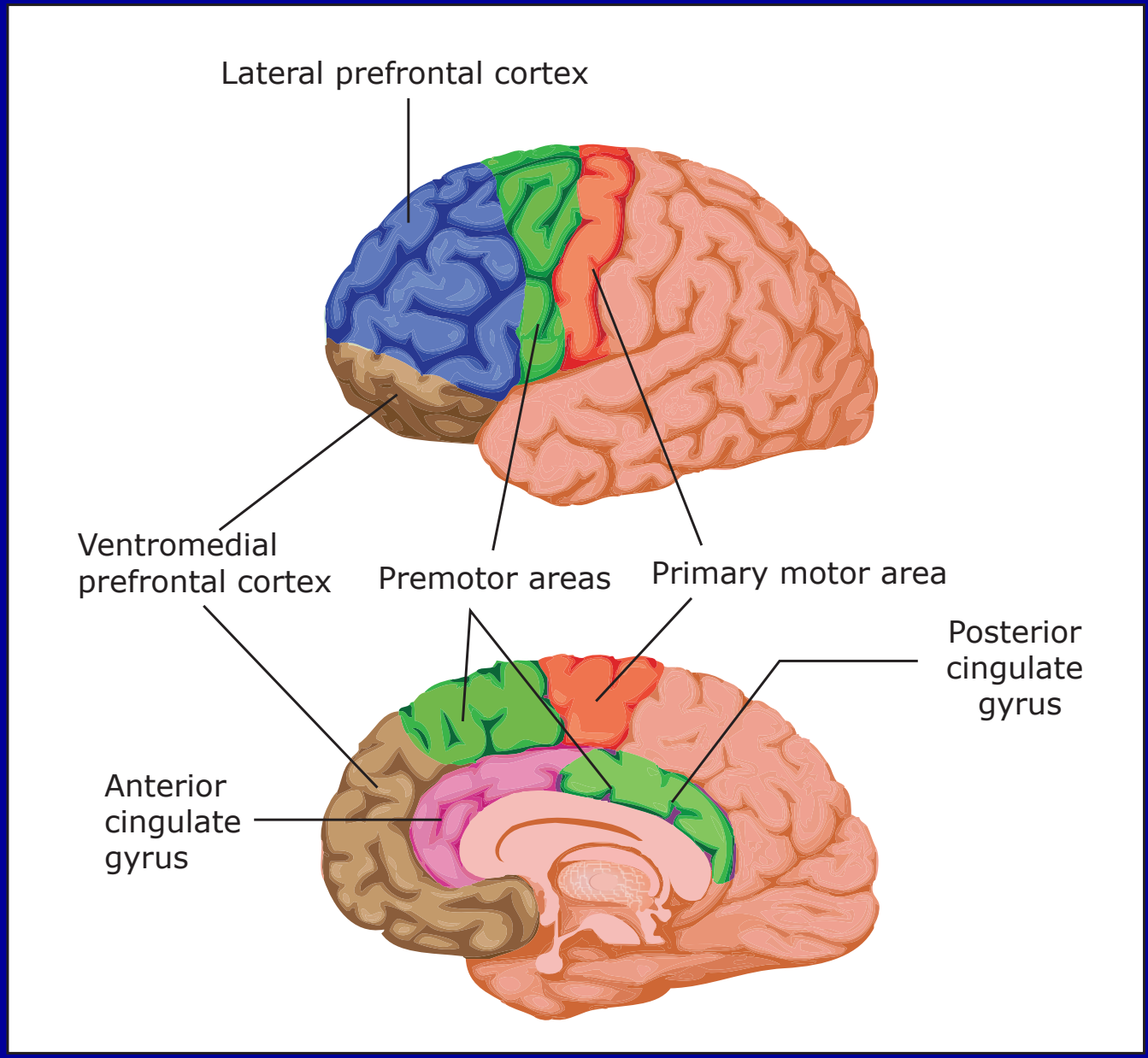
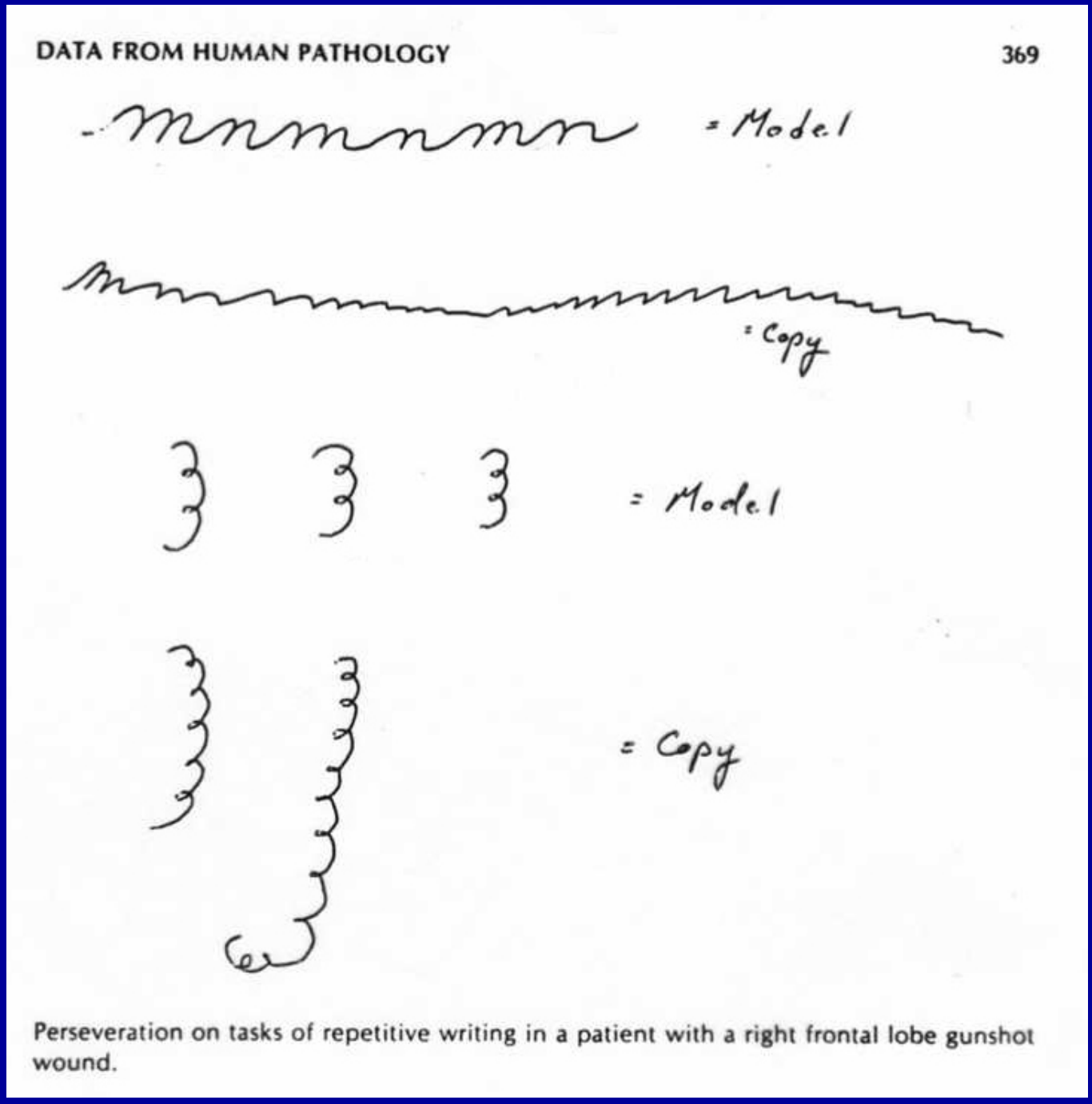


Image by MIT OpenCourseWare.

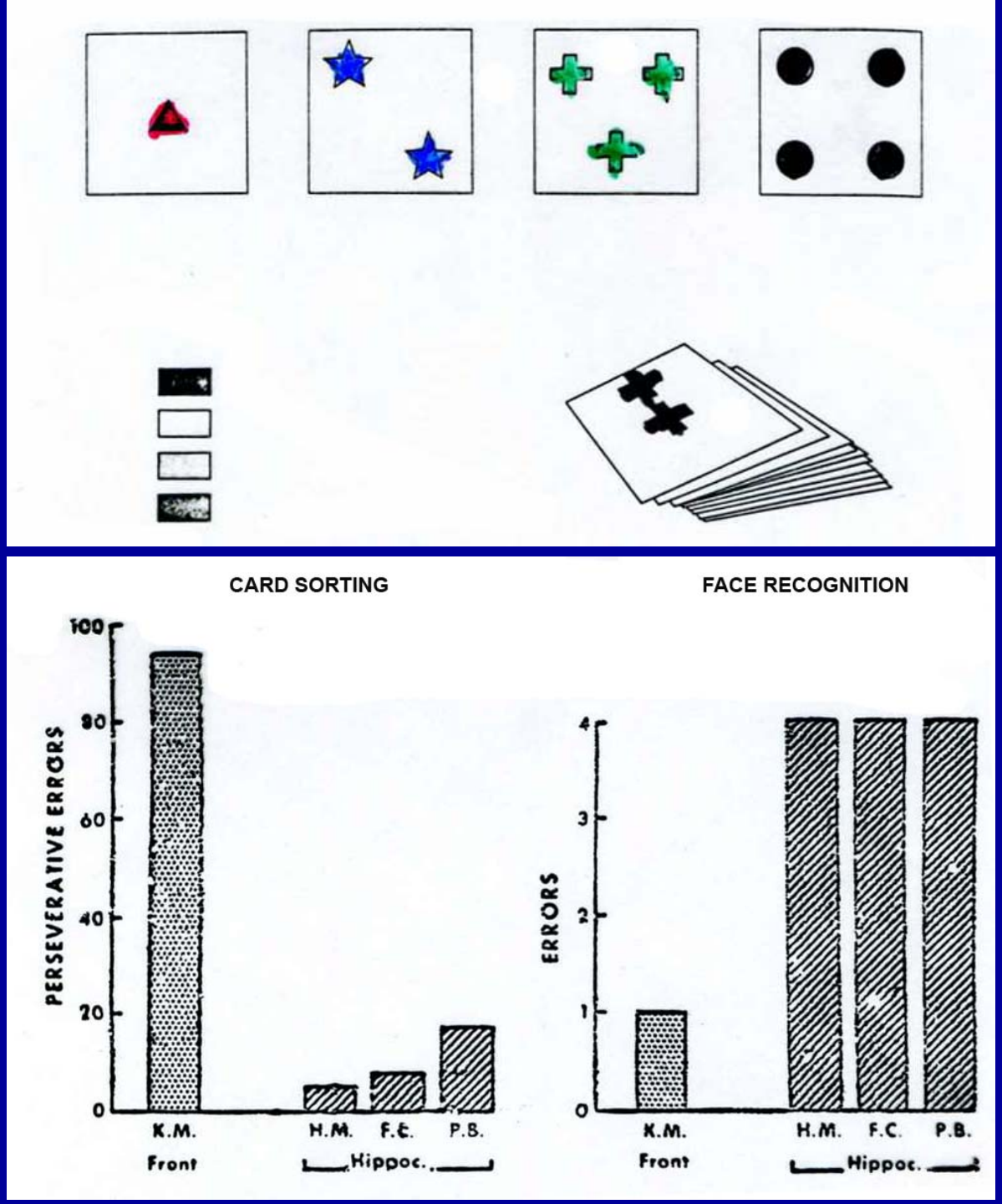


Perseveration on tasks of repetitive writing in a patient with a right frontal lobe gunshot wound.

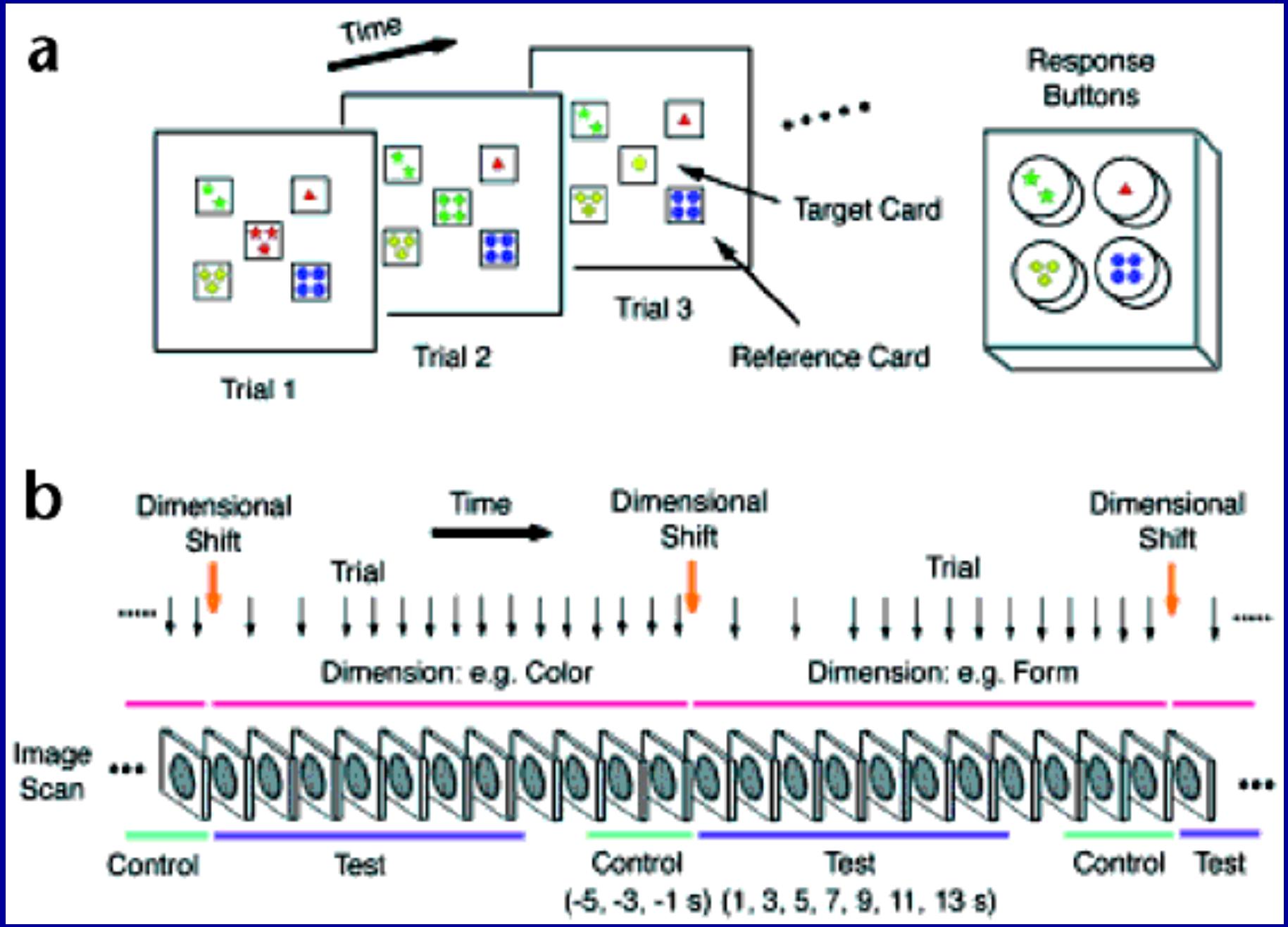
Source: Hécaen, H., and M. L. Albert. *Human Neuropsychology*. John Wiley & Sons, 1978. © John Wiley & Sons. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Cartoon illustrating the Wisconsin Card Sorting Task removed due to copyright restrictions. Fig 12.4 in Gazzaniga, M. S., R. B. Ivry, and G. R. Mangun. Cognitive Neuroscience. 2nd edition. WW Norton & Co., 2002.

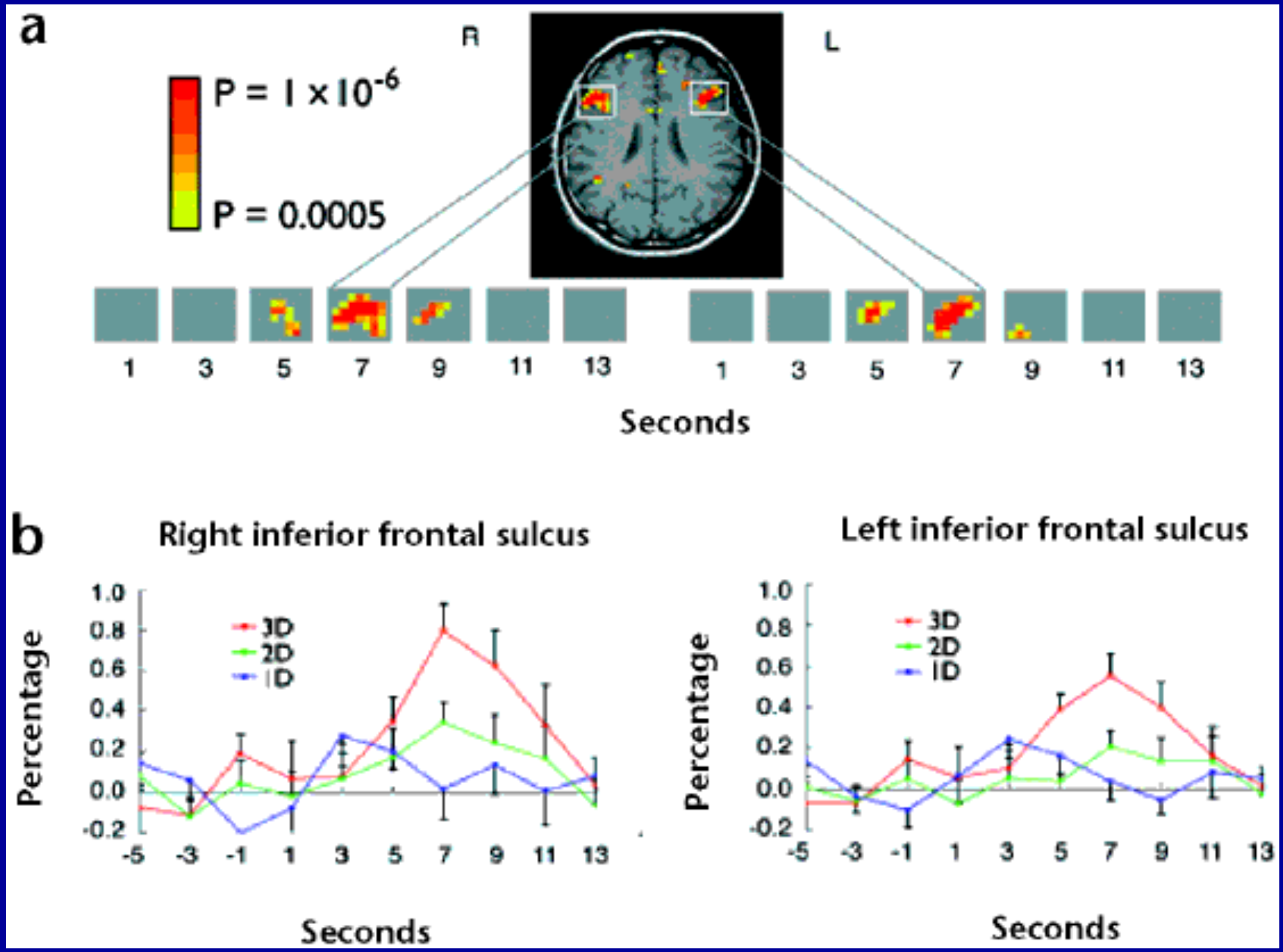
See lecture video.



Source: Milner, B. "Some Effects of Frontal Lobectomy in Man." In *The Frontal Granula Cortex and Behavior*. Edited by J. M. Warren and K. Akert. McGraw-Hill, 1964. © McGraw-Hill. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.



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Frontal Lobes & Problem Solving

Card Sorting

- perseveration (motor parallel)
- role of inhibition in selection of actions
- mental flexibility

utilization behavior & ventromedial lesions – Lhermitte

hammer, nail, picture – patient hangs picture

hypodermic needle, turns around, lowers pants – patient injects himself

Frontal Lobes & Problem Solving

Estimation

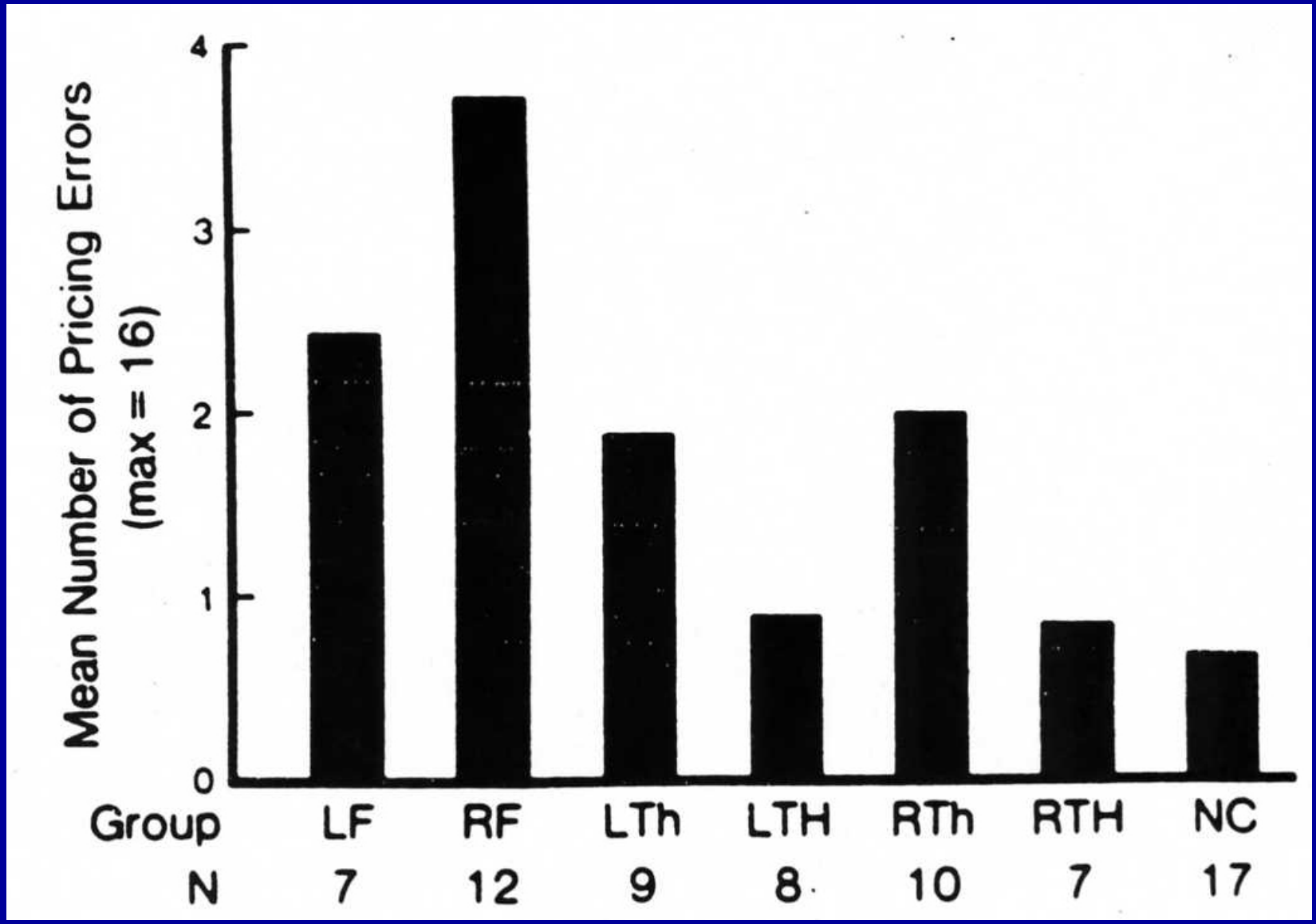
- **Facts: (Shallice & Evans, 1978)**
- **How long is a man's spine?**
- **How fast does race horse gallop (8/60 mph)**
- **What is the largest object normally found in the house?**
- **How many camels are there in the Netherlands?**

Prices: (Smith & Milner, 1984)

- **Prices of objects**

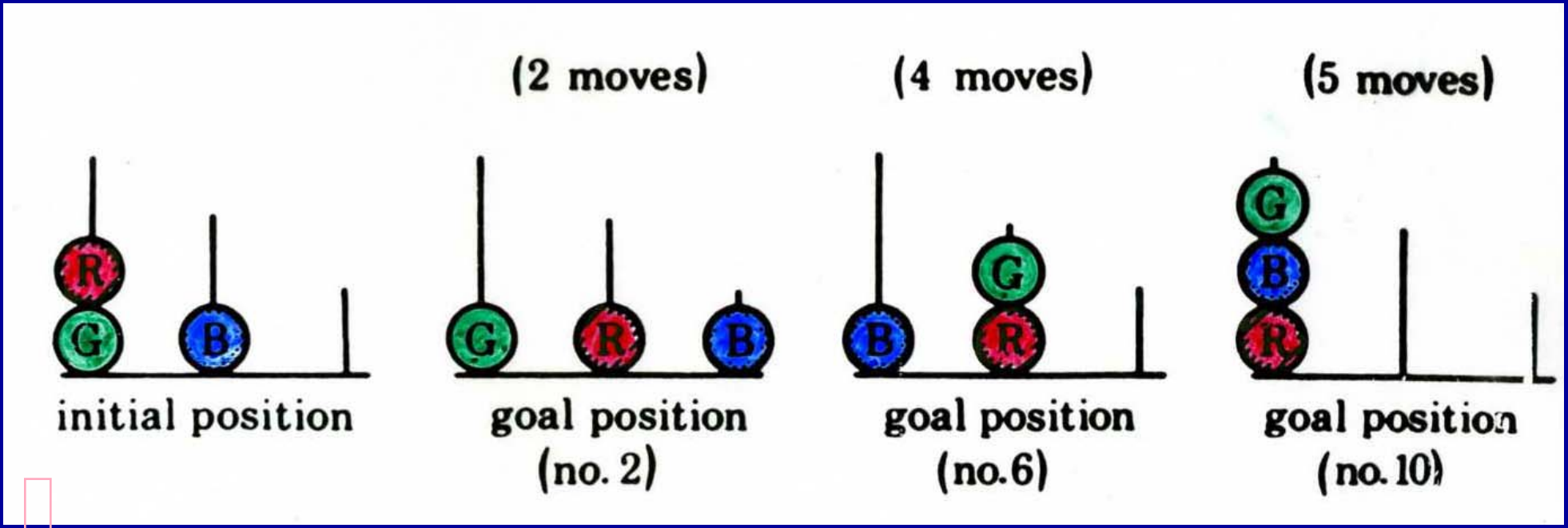
Tower of London (Shallice, 1981)

Pricing Estimation



Smith, M. L., and B. Milner. "Differential effects of frontal-lobe lesions on cognitive estimation and spatial memory." *Neuropsychologia* 22, no. 6 (1984): 697-705.
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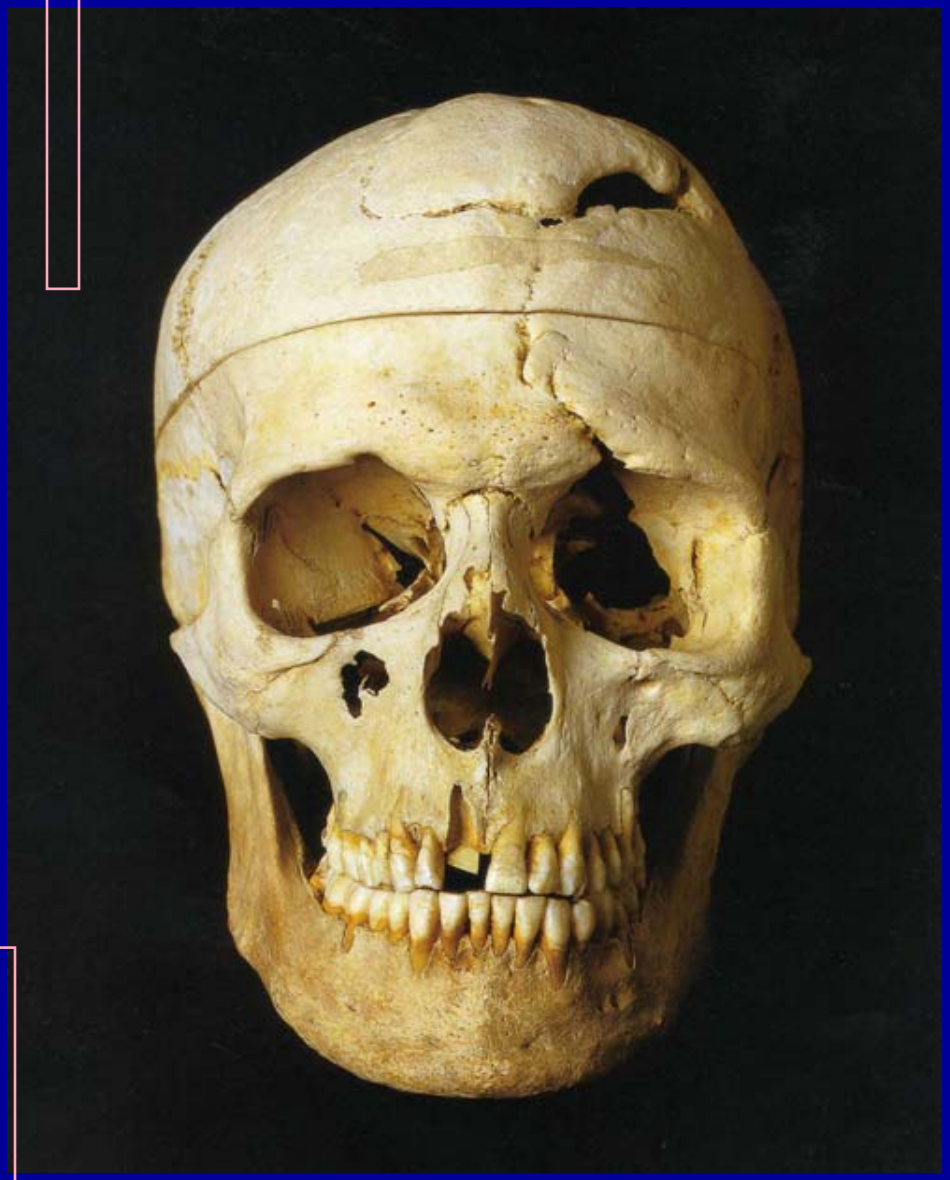
Tower of London



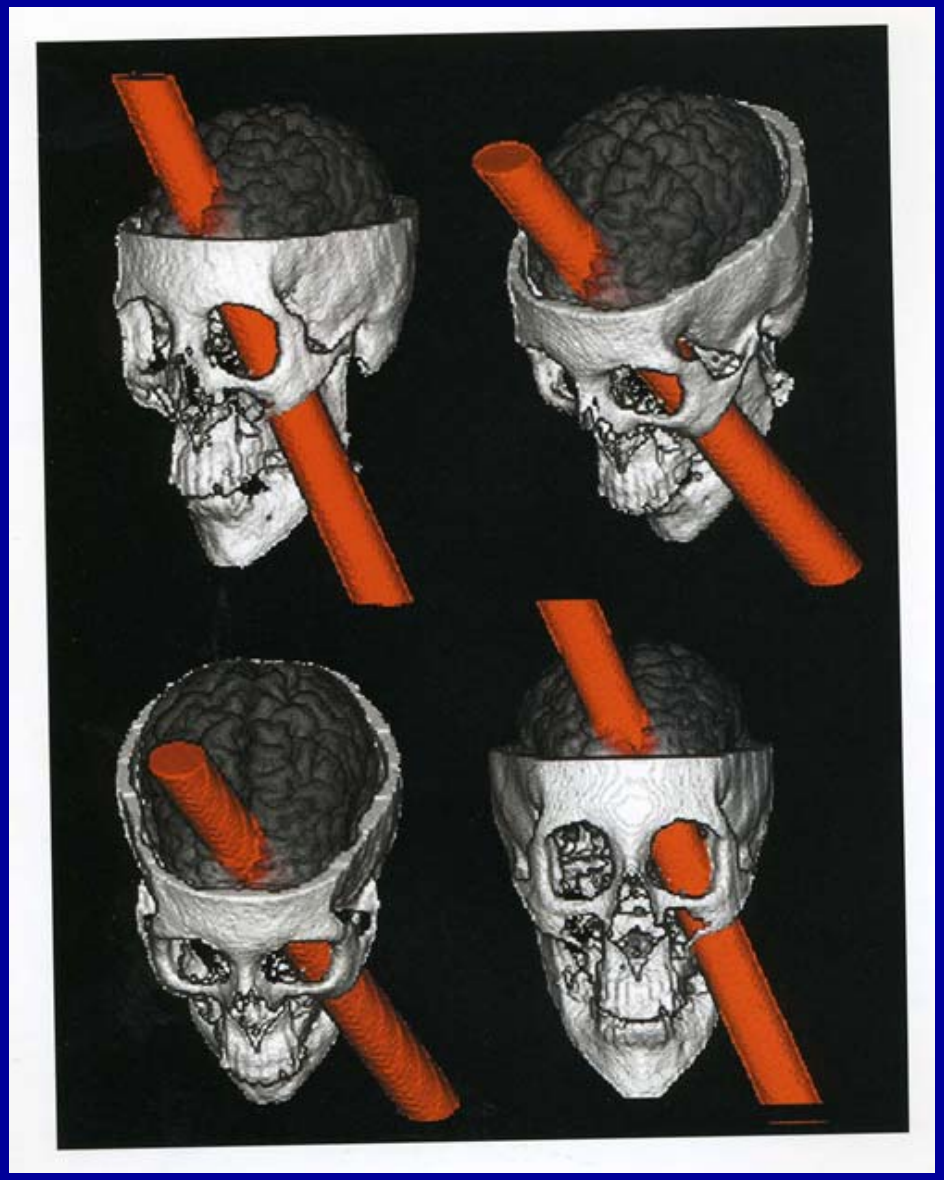
Shallice, T. "Specific impairments of planning."
Phil. Trans. R. Soc. Lond. B 298, no. 1089 (1982): 199-209.

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Phineas Gage



Photos from Fleischman, John. *Phineas Gage: A Gruesome but True Story About Brain Science.* © Houghton Mifflin. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.



Source: Damasio, H., et al. "The Return of Phineas Gage: Clues About the Brain from the Skull of a Famous Patient." *Science* 264, no. 5162 (1994): 1102-5. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Orbitofrontal Lesions – Relation of Thoughts and Emotions

1. Phineas Gage

2. Orbitofrontal patients
 - GSR is measure of autonomic response – related to sweat – emotional reactivity – used for lie detection
 - no GSR in response to faces of family members vs. strangers (opposite of prosopagnosic patients)
 - no GSR in response to emotional relative to neutral pictures
 - disconnection between thought and emotion

Risk Taking

- low immediate rewards but positive long-term rewards vs. high immediate rewards but higher long-term loss (delayed gratification)
- two decks of cards – pick a card and win or lose $$$$

 Pile A – win $50/lose $100

 Pile B – win $100/lose $1250
- controls select Pile A over time
- orbitofrontal patients select Pile B
- GSR – goes up as somebody picks up a card – for controls, GSR was large when selecting from risky Pile B – no anticipatory GSR for patients – disconnection between thought and emotion
- same pattern for injuries at 15 months & 3 months when tested as adults

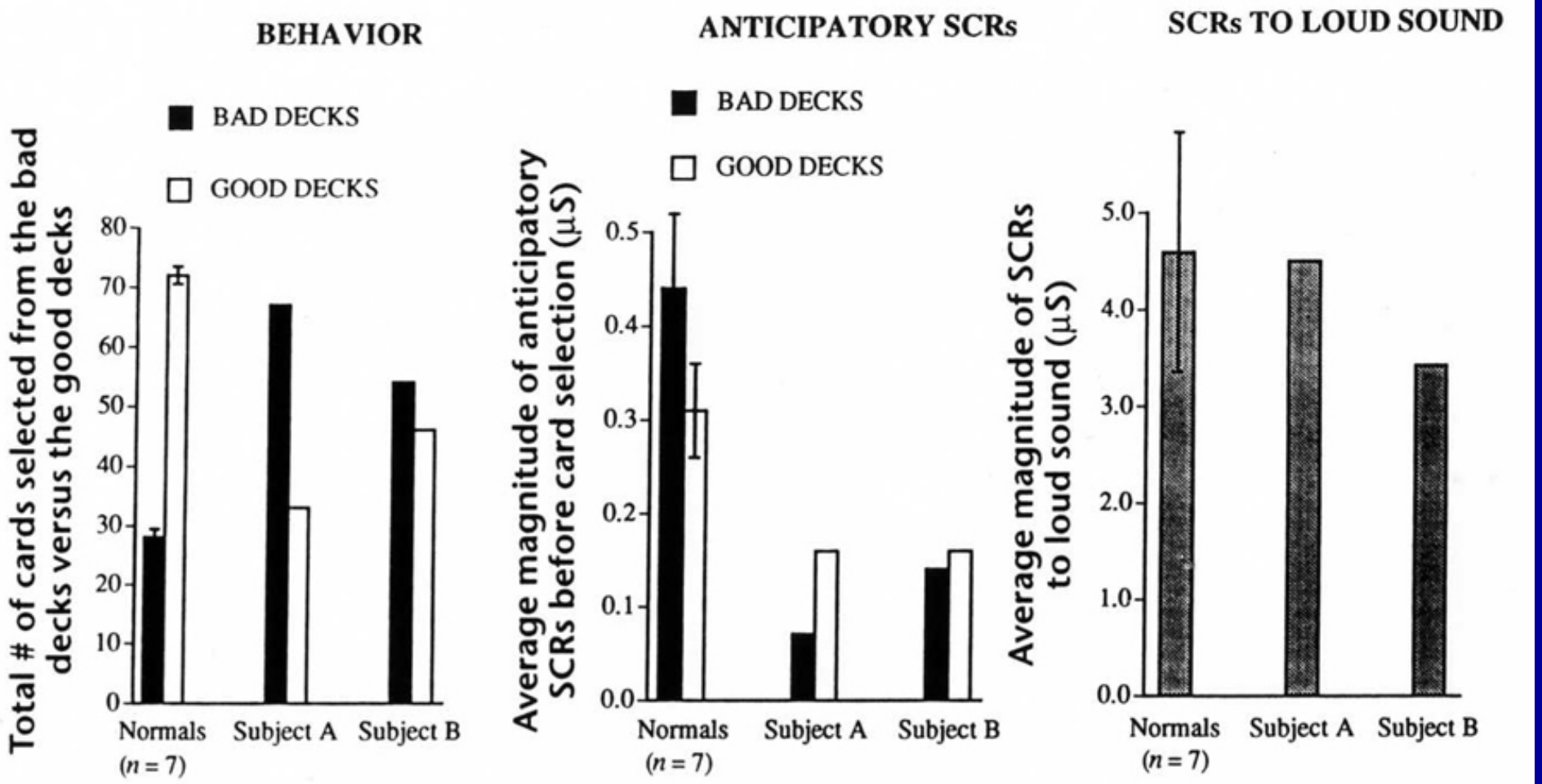


Fig. 2. Experimental decision-making and psychophysiology. (**a**) Responses on the gambling task. (**b**) Anticipatory skin conductance responses (SCRs). (**c**) SCRs to an unconditioned stimulus (sudden onset of 110-dB noise).

Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience. Source: Anderson, S. W., et al. "Impairment of Social and Moral Behavior Related to Early Damage in Human Prefrontal Cortex." *Nature Neuroscience* 2, no. 11 (1999): 1032-7. © 1999.

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9.00SC Introduction to Psychology
Fall 2011

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INTELLIGENCE

John Gabrieli 9.00

Exam 2 – Next Thursday

50 multiple-choice questions

30 from book (Chapters 5-7)

20 from Sacks & lectures

5 short answers (4 pts)

Select 5 from 8-10 choices

70 points

WHY HAVE TESTS?

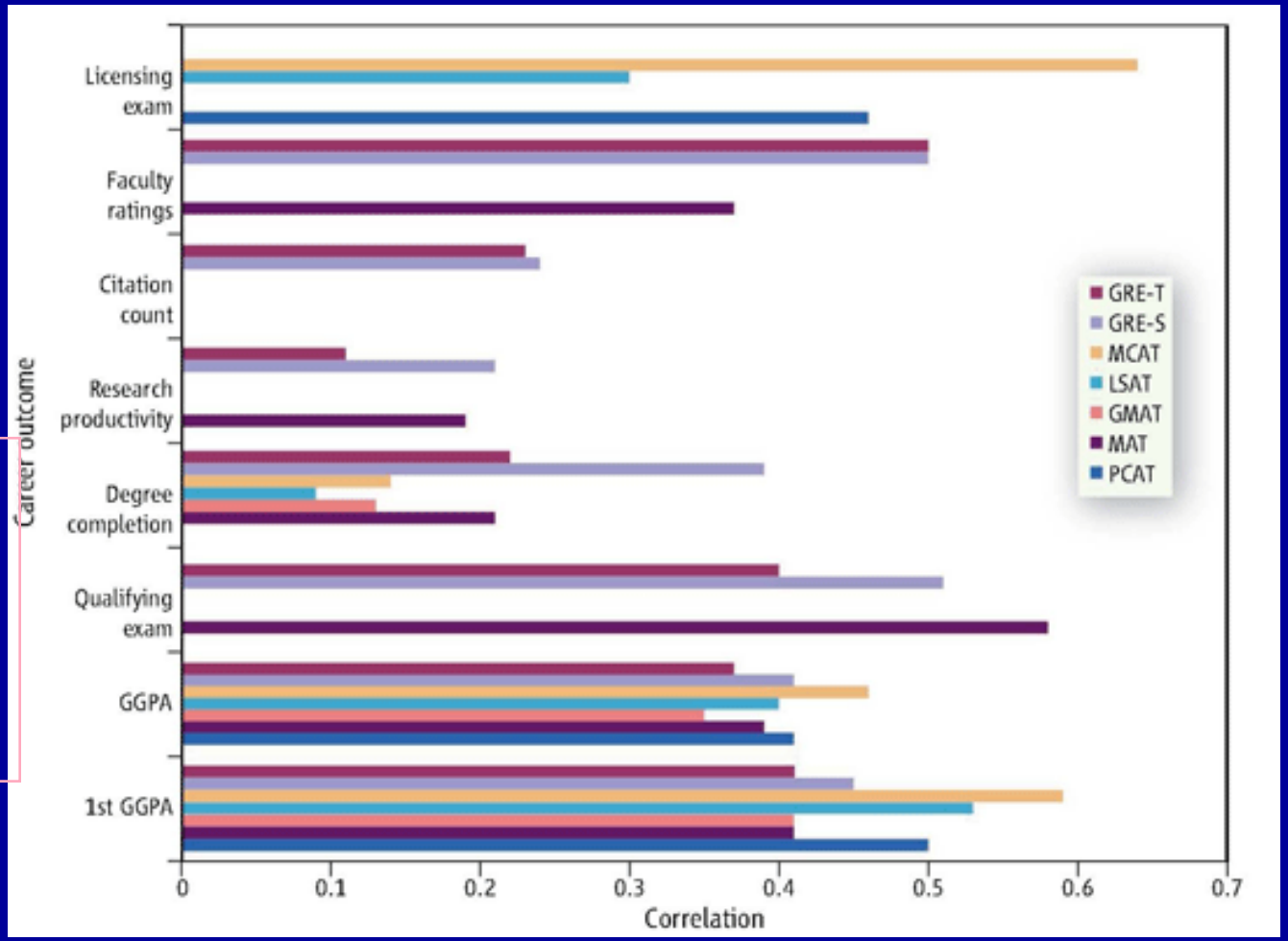
WHY HAVE TESTS?

- learning
- selection & prediction

 achievement

 aptitude (SAT, GRE)

Standardized tests and graduate students' success



- tests are good predictors
- tests predict success better than grades
- combination of tests and grades is best

Kuncel & Hezlett, *Science*, 2007

(.4 correlation between sex & height)

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WHAT IS *INTELLIGENCE*?

WHAT IS *INTELLIGENCE*?

- ability to solve problems
- understand and learn complex material
- adapt to the environment
- mental quickness

WHAT MAKES SOMETHING AN EXPERIMENT?

dependent variable

what you measure - the outcome

independent variable

what you vary

Studies of intelligence are almost always correlational and rarely experimental

Studies of intelligence focus on differences among people rather than intelligence per se

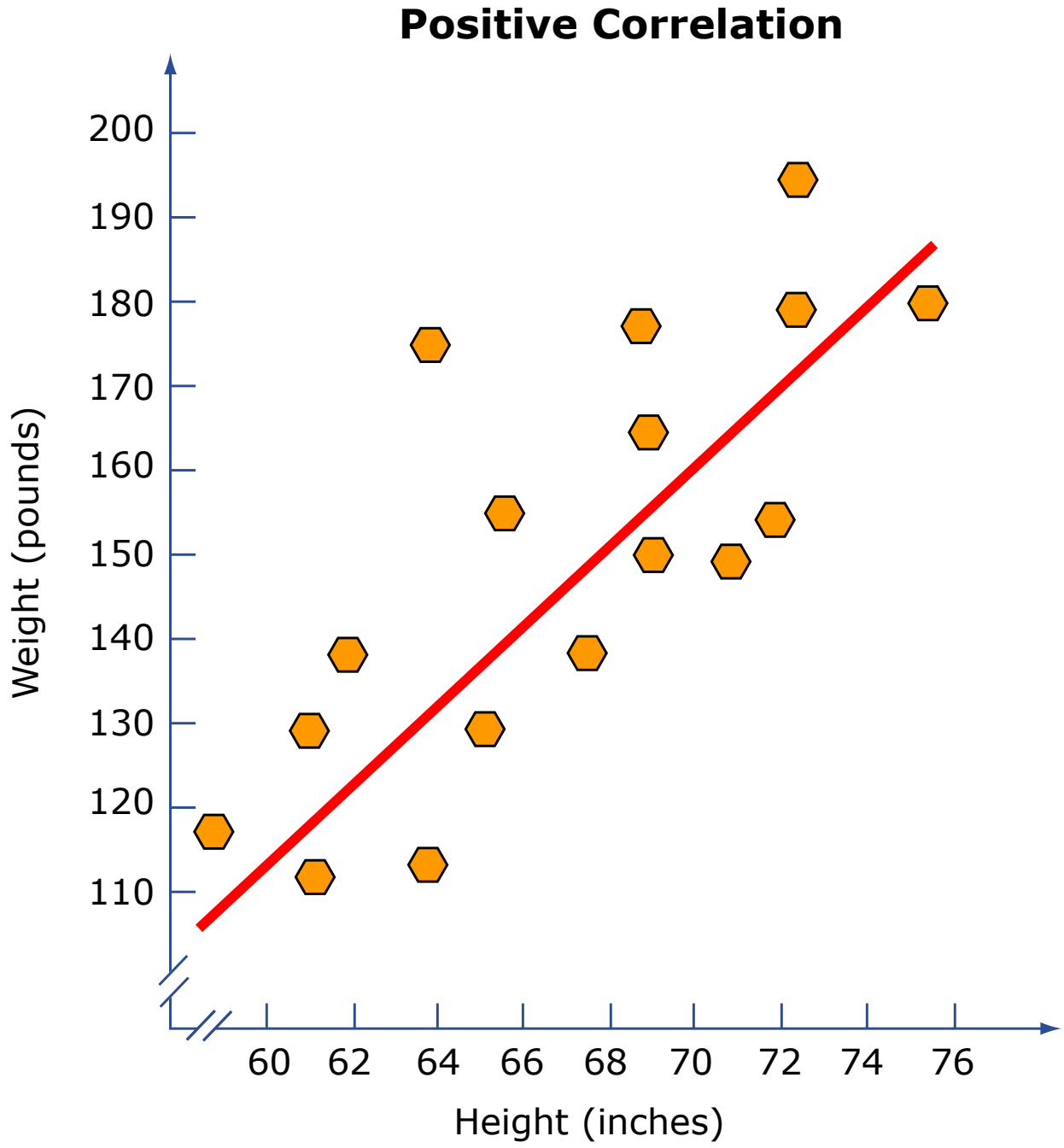


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IQ = Intelligence Quotient

- France, 1904-1911, universal elementary education
- Alfred Binet, physician, aimed for an objective way to identify children who needed extra help
- many abilities, many tests - copy a drawing, repeat digits, recognize coins, explain why a statement did not make sense

IQ = Intelligence Quotient

- give test to normal children at multiple ages
- mental age vs. chronological age

IQ = Intelligence Quotient

- David Wechsler

Wechsler Adult Intelligence Scale (WAIS)

Wechsler Adult Intelligence Scale for Children (WISC)

Verbal Subtests and Performance Subtests

WAIS - III

- **Verbal Subtests**
 - ***Vocabulary*** **- define words**
 - ***Similarities*** **- how are an airplane and a car alike**
 - ***Arithmetic*** **- simple operations**
 - ***Digit Span*** **- digits in STM capacity**
 - ***Information*** **- who was Martin Luther King, Jr.?**
 - ***Comprehension*** **- why are there taxes?**

WAIS - III

- **Performance Subtests (nonverbal)**
 - ***Picture Completion* - what is missing?**
 - ***Digit-Symbol Coding***
 - ***Block Design***
 - ***Matrix Reasoning***
 - ***Picture Arrangement* - order pictures**

IQ = Intelligence Quotient

- give test to normal children at multiple ages
- mental age (MA) vs. chronological age (CA)

IQ = (MA/CA) X 100

Average = 100

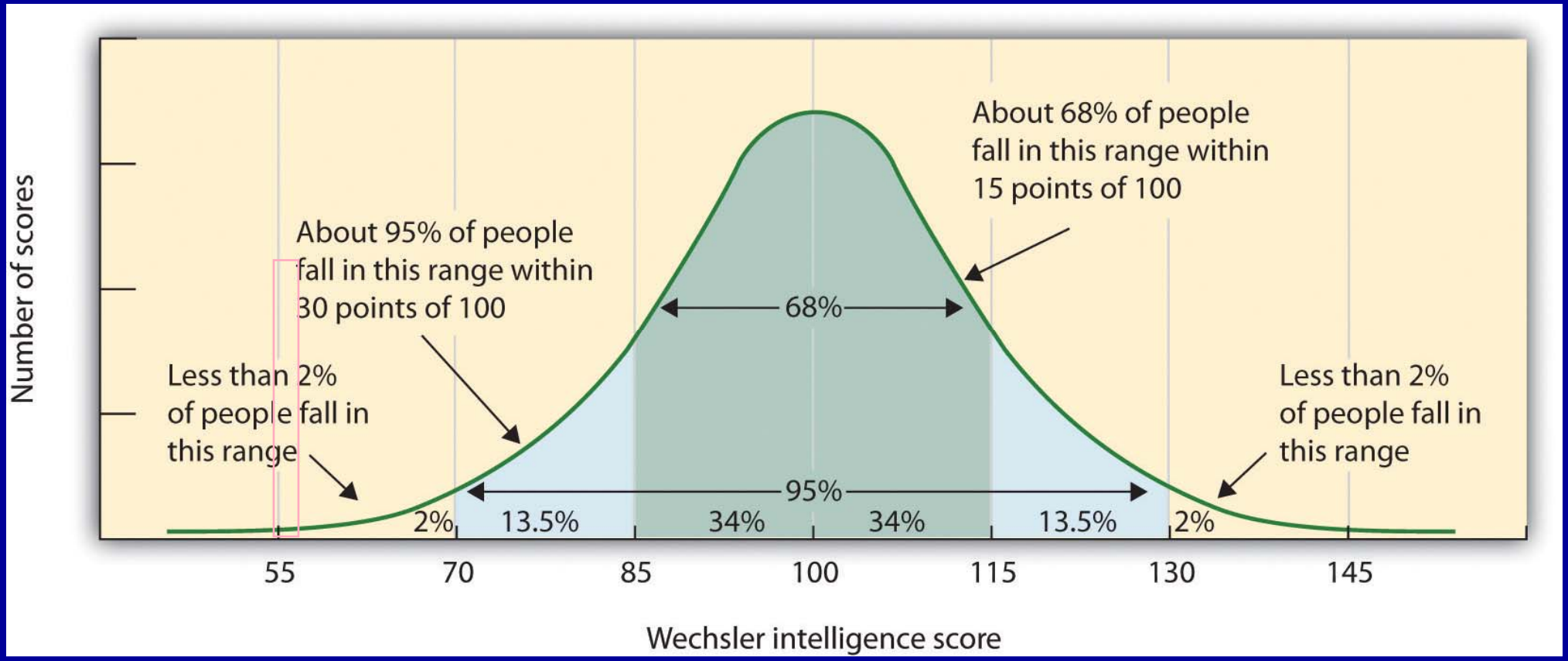
Standardized Test

- standardized sample - random population
- normal distribution
- norming (raw score vs. standardized score)

mean = 100 standard deviation = 15 for WAIS

67% of people are +/- 1sd (85-115); more than 2sd = 4.54%

Age norming - on 6th birthday - move from 120/100 - 40 year-old like undergrad raw score = 230 IQ



Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.

< 70 a big problem

Top 2% = Mensa

RELIABILITY & VALIDITY

- Reliable - same score on two occasions

- Valid - measures what it is supposed to measure

VALIDITY

- IQ - correlates with GPA in high school and college, job success, salary, stable marriages, staying out of jail, longevity

- 25% of variation
 (personality, education, culture)

WHAT DO 15 IQ POINTS MEAN?

100 IQ - average in high school, year or two in community college

115 IQ - at least college, white collar

85 IQ - dropping out of high school, skilled labor

Relationship between IQ and income and percentage of women having illegitimate children, for siblings from the same stable, middle-class family who differ in IQ.

IQ Group	*Income*	*Illegitimacy Rate (%)*
Very bright siblings (120+)	$70,700	2
Bright siblings (110-119)	$60,500	10
Reference group (90-109)	$52,700	17
Dull siblings (80-89)	$39,400	33
Very dull siblings (<80)	$23,600	44

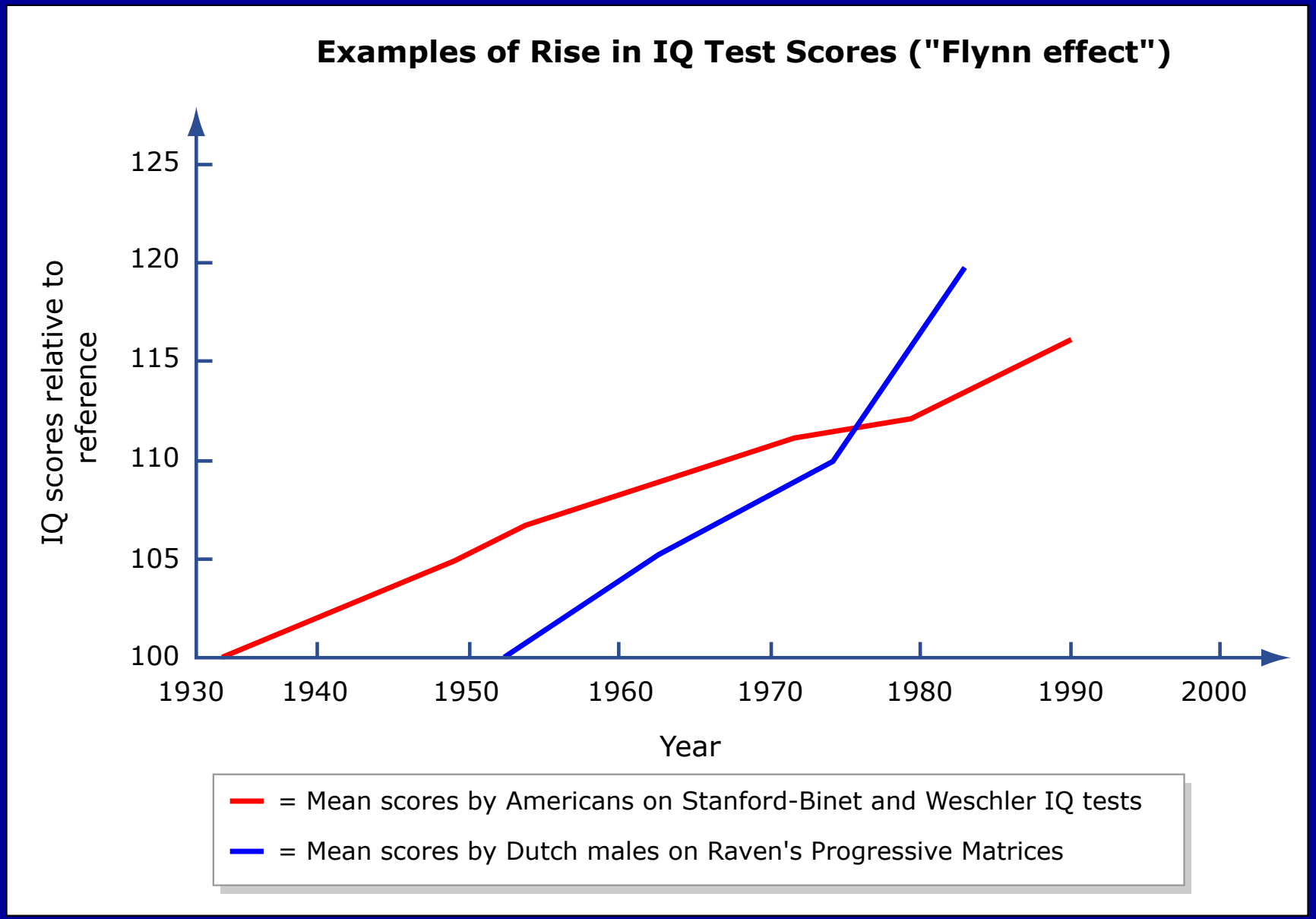


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Generational Increases in Intelligence Scores

(James) Flynn effect - Raven's Progressive Matrices - IQ scores going up 3 points every 10 years

- born in 1930 - IQ 100
- child - 108
- grandchild - IQ 120 (standard deviation higher)
- (100 IQ today - grandparent IQ 82)
- 1900 mean IQ of 70????
- daily life? nutrition? reasoning?

WHERE ARE THE GAINS?

- **WISC 10 subtests**

- small gains - vocabulary, general knowledge, arithmetic

- large gains - similarities

"In what way are dogs and rabbits alike?"

"both mammals" (abstract/taxonomic)

"you use dogs to hunt rabbits" (functional)

ABSTRACT THINKING

- Kpelle Tribe - Liberia

sort basket of food, tools, containers, clothing

functional pairings - potato and knife

how would a fool do it?

taxonomic categories

INTELLIGENCE TESTS

- value attached to a specific time and a specific test
- constant re-norming to set each subtest to population mean of 100
- 70 as cut-off for mental retardation - WISC-III comes out in 1991, number labeled mentally retarded doubled

MODELS OF INTELLIGENCE

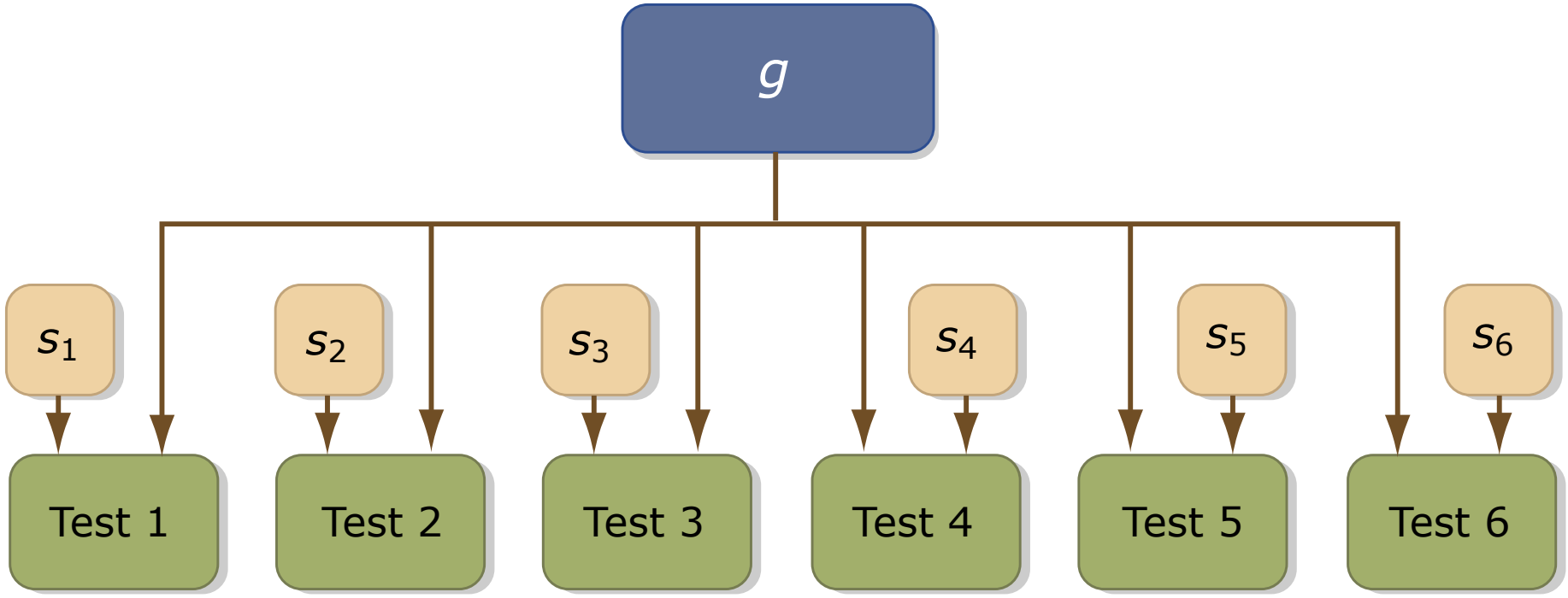
- psychometric analysis of subtests
- positive correlation among subtests
- Spearman - "*g*" - *general intelligence*

 "*s*" - *specific intelligence*
- Thurstone - 56 tests - 7 primary mental abilities (verbal, spatial, etc.)
- Cattell & Horn

 fluid intelligence - novel tasks

 crystallized intelligence - known information

Spearman's Theory of Intelligence



g = general intelligence
s = specific intelligenc

Image by MIT OpenCourseWare.

Fluid vs. Crystallized Intelligence

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Reference: p. 10 in
http://www.wiley.com/college/westen/0471387541/ppt/lecture/ch8.ppt
(Companion content for textbook Western, D. *Psychology* 3/e, Wiley, 2002.)

Average Scores on Mental Tests as Function of Age

Content removed due to copyright restrictions. See lecture video.

Reference: Fig. 10.11 in Gray, P. O. *Psychology* 5/e, Macmillan, 2006.
http://books.google.com/books?id=o6m9AyzSbAkC&lpg=PA369&pg=PA369#v=onepage&q&f=false

MODELS OF INTELLIGENCE

- psychometric analysis of subtests
- positive correlation among subtests
- Carroll - Three-stratum theory (in 1993 from 450 studies)

g, 8 specific factors, more factors

all levels contribute to task performance

but “g” remains best predictor in real life

EMOTIONAL INTELLIGENCE EQ

- Salovey - perceiving emotion, faciltating though with emotion, understanding emotion, managing emotion

Theory of Multiple Intelligences

Gardner

- patients, development, special skills
- Linguistic, Spatial, Music, Logical-Mathematical, Bodily-Kinesthetic, Intrapersonal, Interpersonal, Naturalist, Existential
- profile of intelligences
- ? Measurement, skills

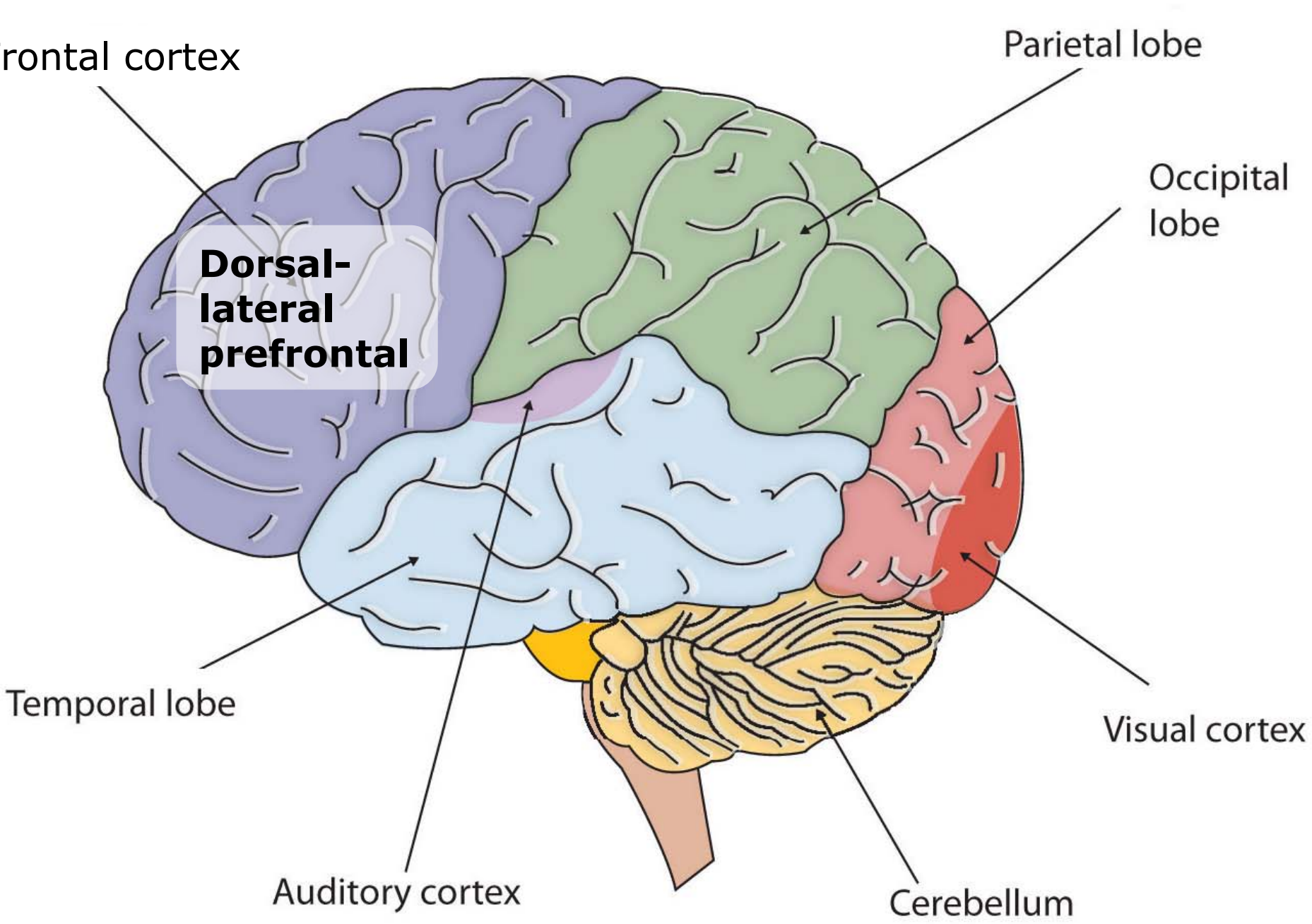
Intelligence: Mental & Neural Mechanisms

- **Mental Speed**

 high correlation between IQ and simple reaction time speed, speed of simple perception of line lengths

- **Working Memory**

 holding goal-relevant information in mind

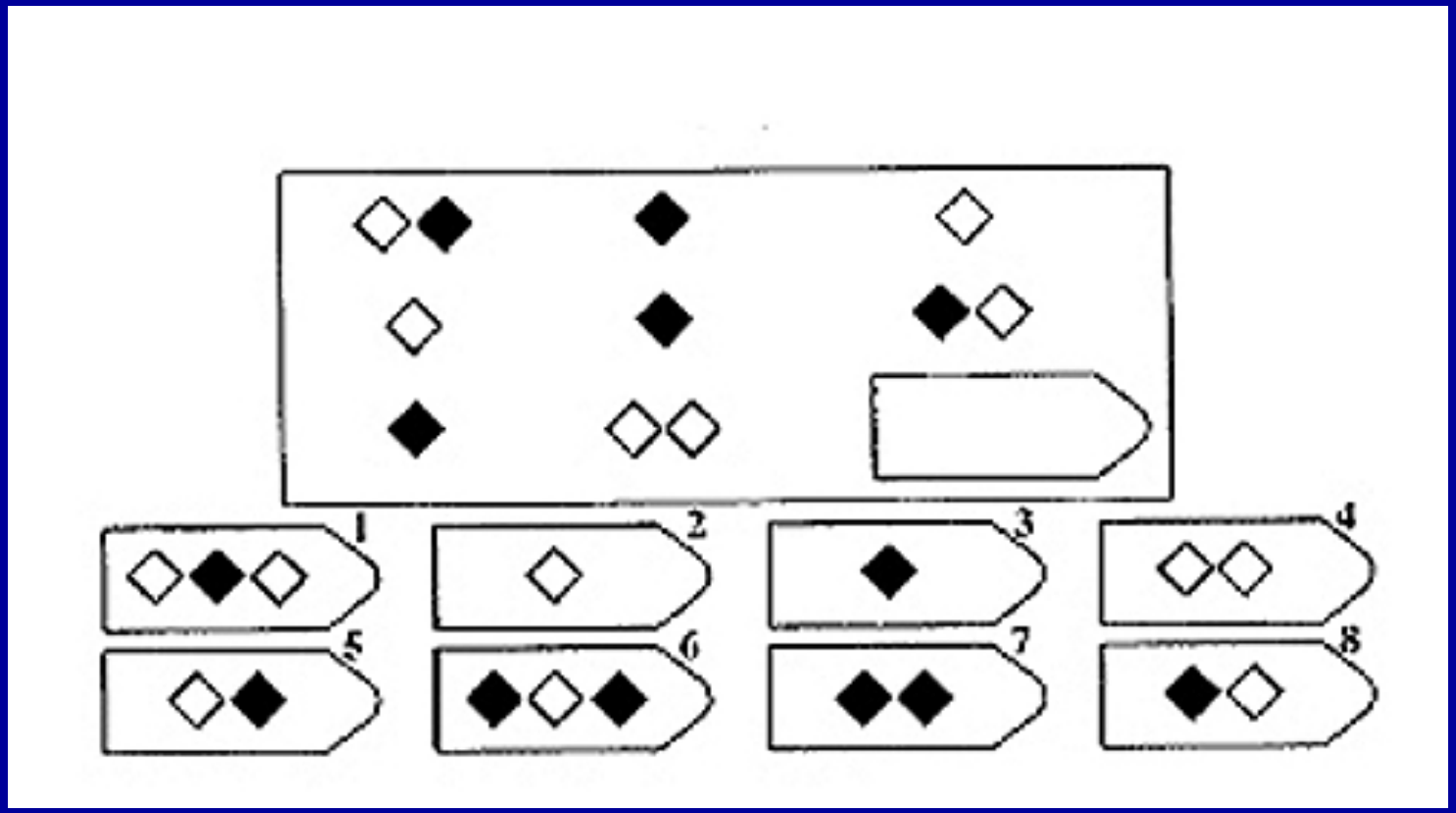


Adapted from Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.

Image removed due to copyright restrictions. See lecture video.

Example of an item on a Culture-Fair Test, from Chapter 7 in Wood, S. E., E. G. Wood, and D. Boyd. *Mastering the World of Psychology*, 3/e. Allyn & Bacon, 2007.

Raven's Progressive Matrices



Source: Prabhakaran, V., et al. *Cognitive Psychology* 33, no. 1 (1997): 43-63.
Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

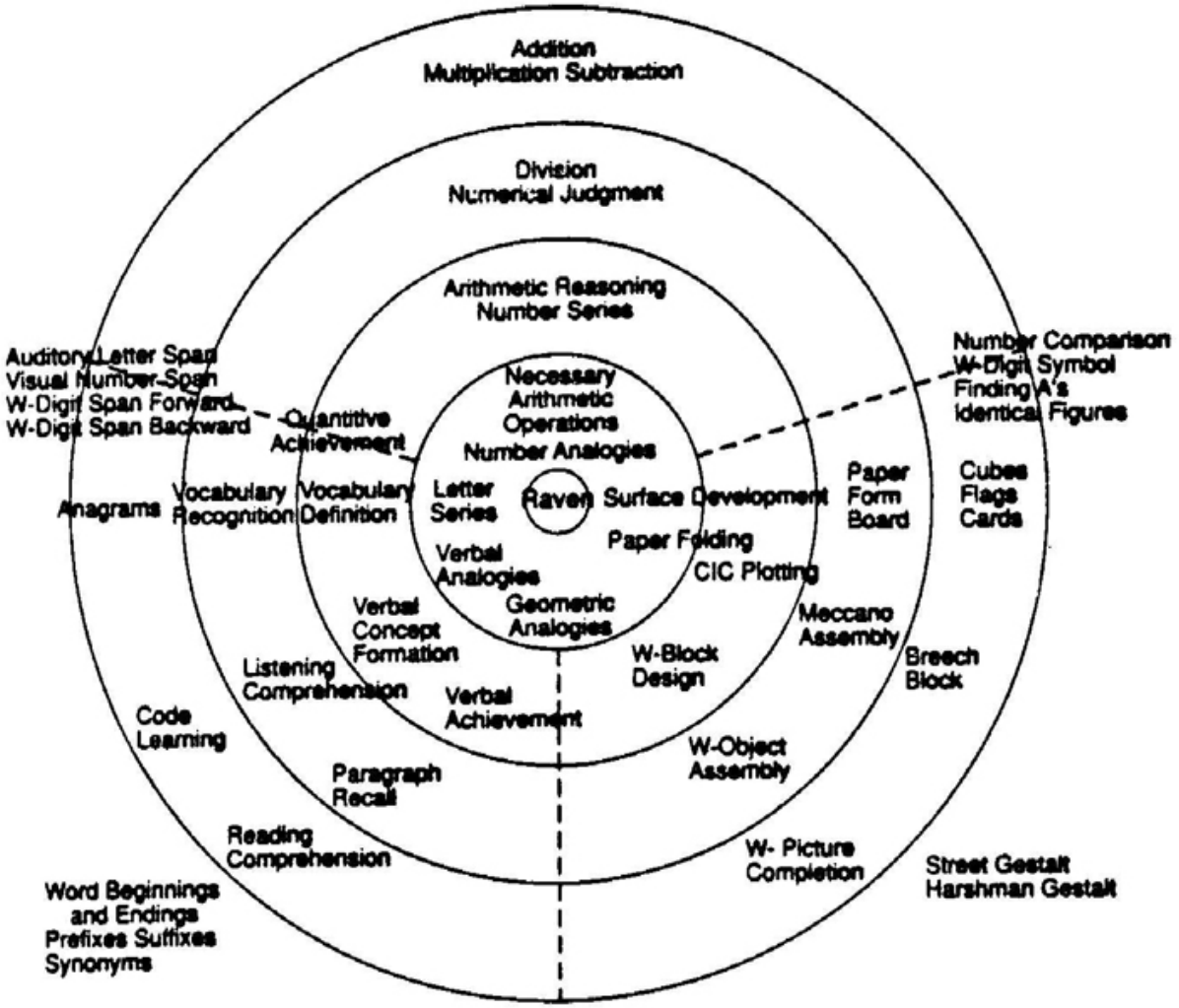
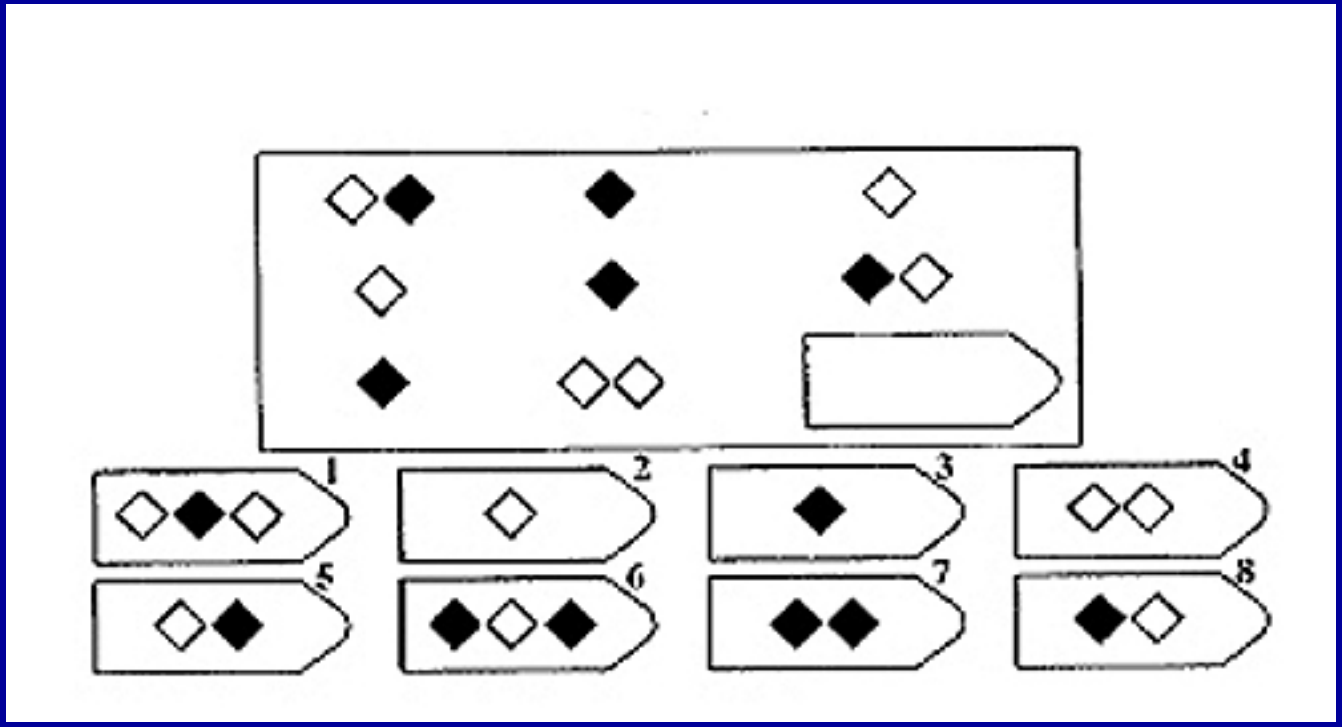


FIG. 1. A multidimensional scaling solution illustrating the intercorrelations among various ability tasks is shown in this idealized model. The Raven's task occupies the center of the model. Complex tasks such as Necessary Arithmetic operations and Verbal Analogies are shown to be near the Raven's task, indicating that performance on these tasks are highly correlated despite their differences in content. The subsequent contours contain tasks that show less correlation to the tasks near the center of the model and cluster more as a function of content area with separate clusters for figural, numerical, and verbal tasks. Tasks involving different content are separated

Source: Prabhakaran, V., et al. *Cognitive Psychology* 33, no. 1 (1997): 43-63.
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Raven's Progressive Matrices





Source: Prabhakaran, V., et al. *Cognitive Psychology* 33, no. 1 (1997): 43-63.
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Table 1 in Duncan, J., et al. “A Neural Basis for General Intelligence.” *Science* 289 (2000): 457-60.

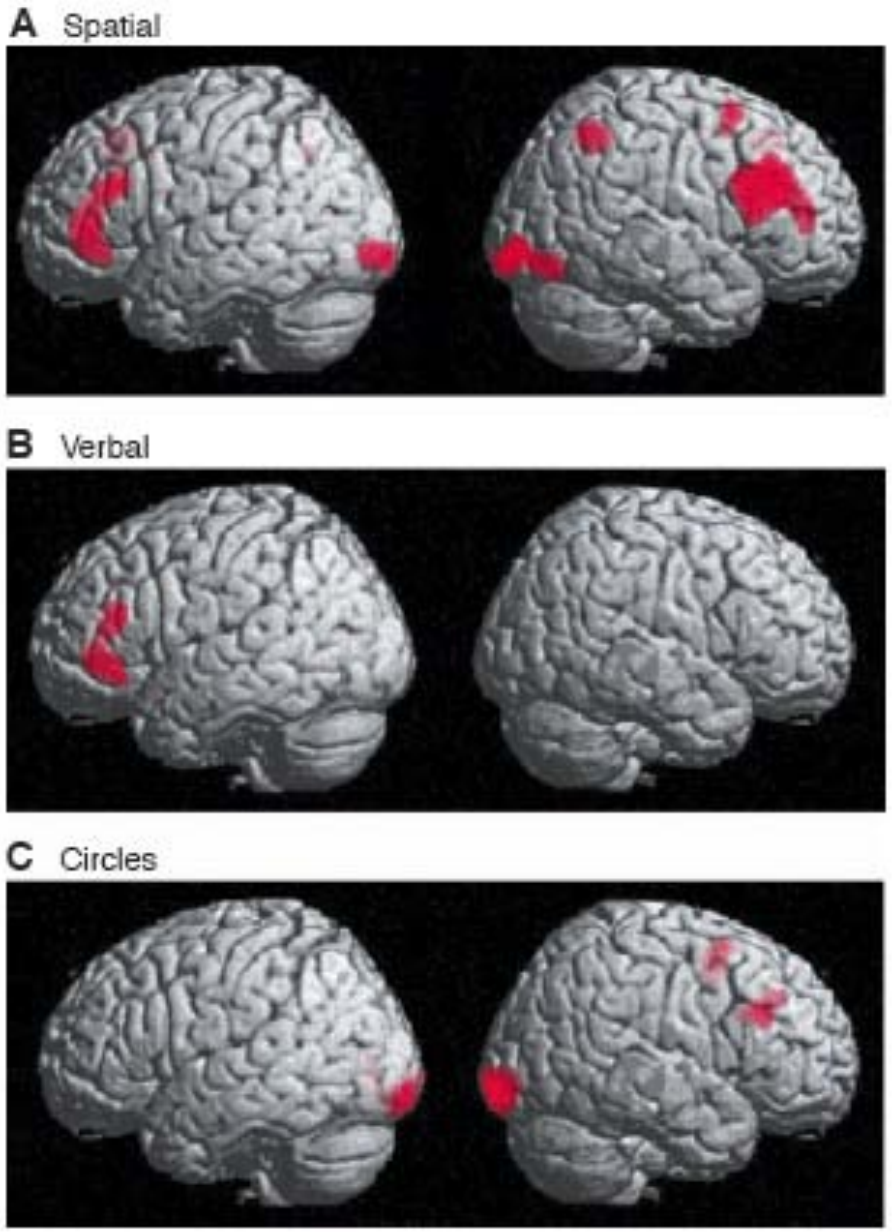


Fig. 2. Significant activations for three contrasts, rendered onto canonical T1-weighted brain image of SPM99. (**A**) Spatial high-*g* minus spatial low-*g* ($P < 0.05$ corrected for multiple comparisons). (**B**) Verbal high-*g* minus verbal low-*g* ($P < 0.05$ corrected). (**C**) Circles minus spatial low-*g* ($P < 0.001$ uncorrected).

Source: Duncan, J., et al. *Science* 289 (2000): 457-60. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

N-Back Task

Greater Frontal Activation with Larger N-Back

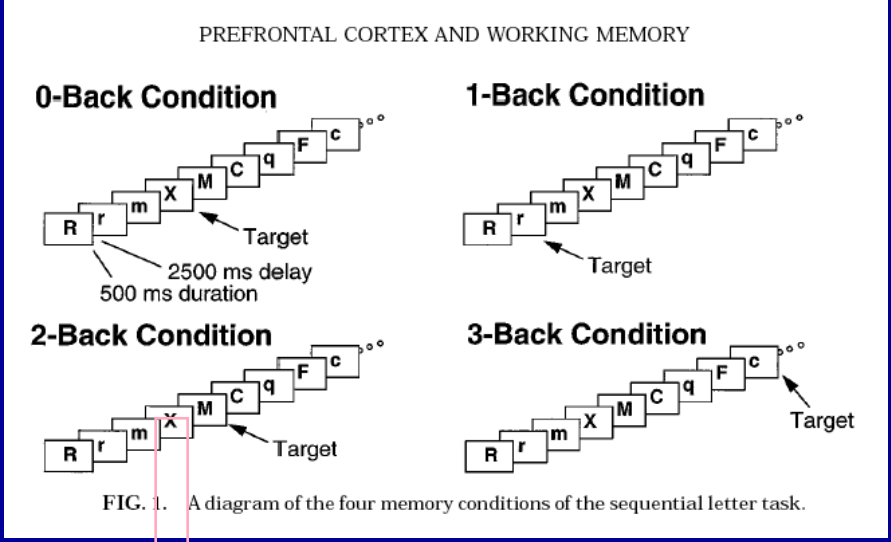


FIG. 1. A diagram of the four memory conditions of the sequential letter task.

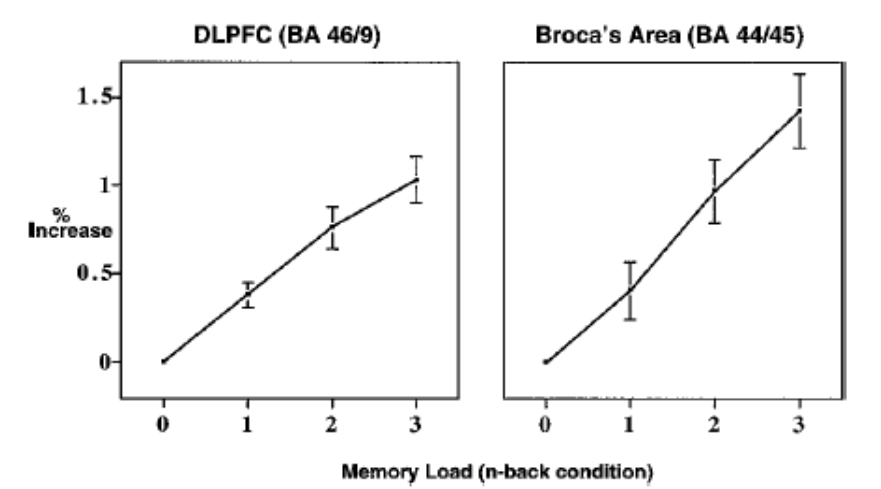


FIG. 3. Plots of the MR signal, expressed as a percentage of difference from the 0-back condition, across the four load conditions. Values are plotted for the MFG region (Talairach coordinates L38,30,22 and R35,22,27) and the IFG region (Talairach coordinates L40,6,26), the only two regions which showed a significant monotonic effect of load. The activity was averaged across the nine subjects; however, each subject showed essentially the same linear relationship to load.

Source: Braver, T. S., et al. "A Parametric Study of Prefrontal Cortex Involvement in Human Working Memory." *NeuroImage* 5, no. 1 (1997): 49-62. Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

3-Back Task

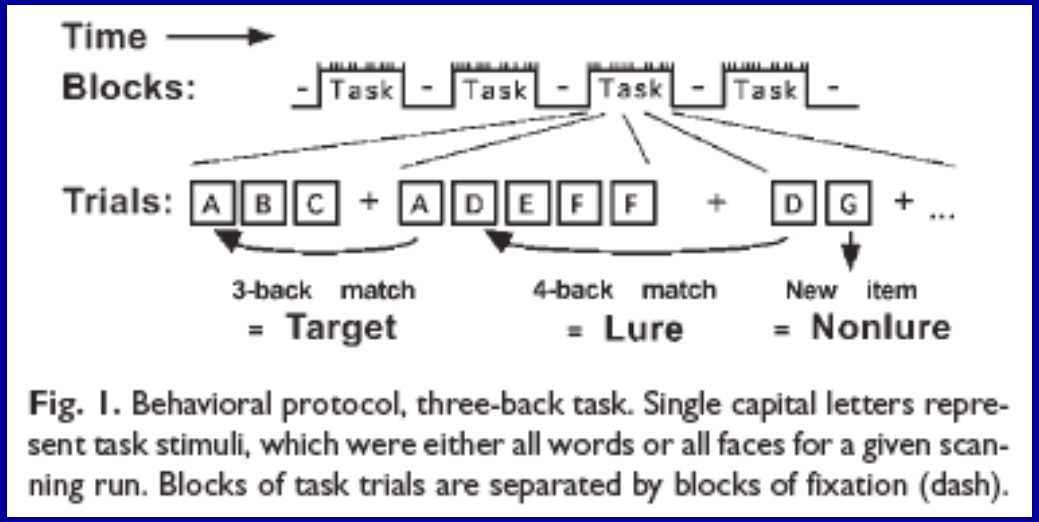


Fig. 1. Behavioral protocol, three-back task. Single capital letters represent task stimuli, which were either all words or all faces for a given scanning run. Blocks of task trials are separated by blocks of fixation (dash).

Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience. Source: Gray, J. R., et al. "Neural Mechanisms of General Fluid Intelligence." *Nature Neuroscience* 6 (2003): 316-22. © 2003.

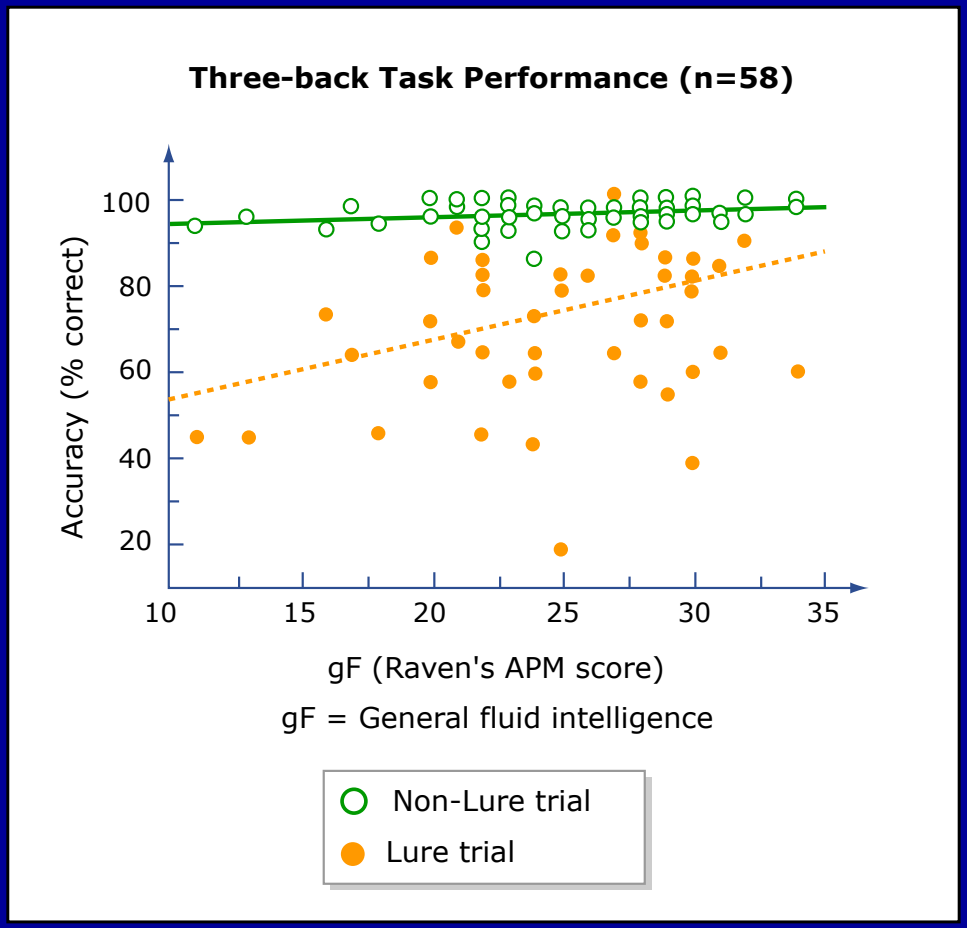


Image by MIT OpenCourseWare.

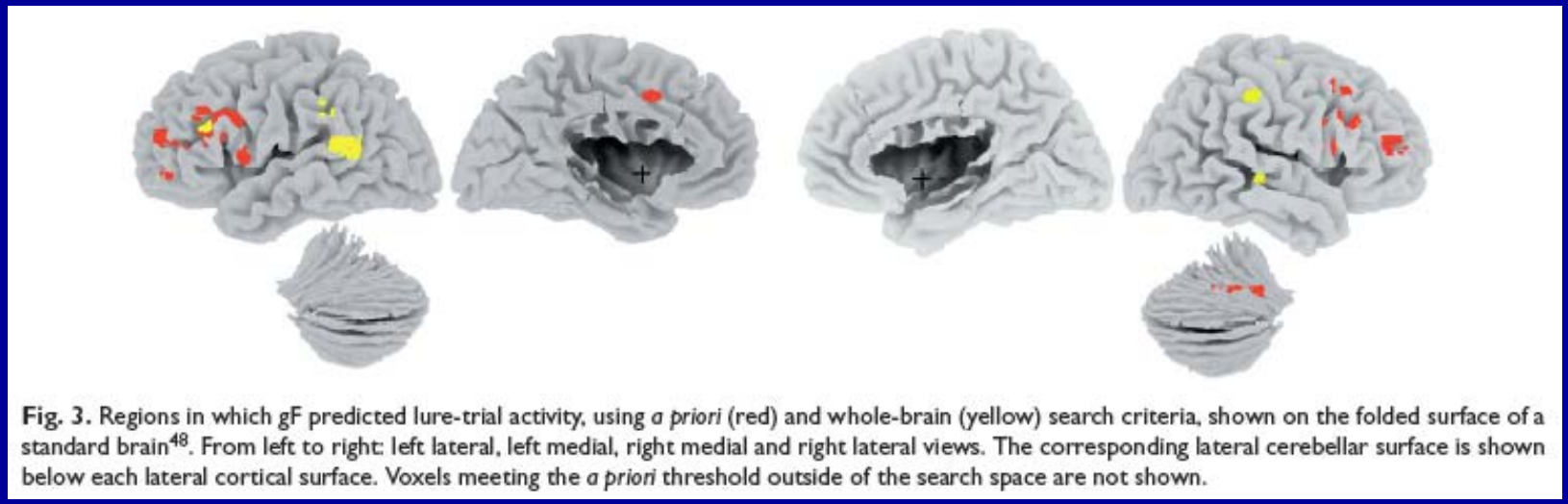
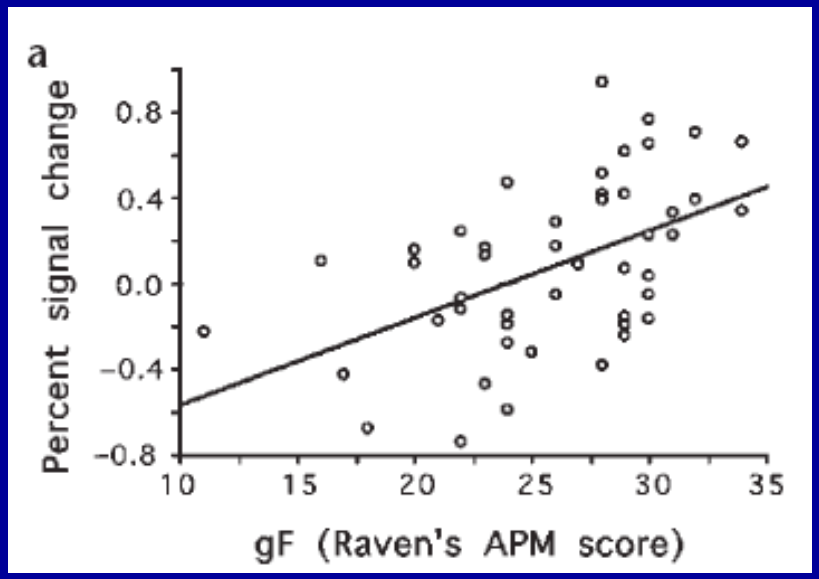
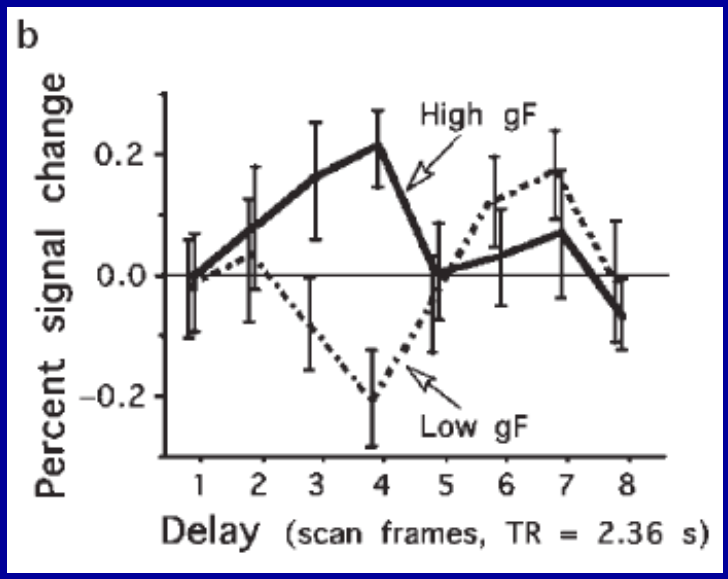


Fig. 3. Regions in which gF predicted lure-trial activity, using *a priori* (red) and whole-brain (yellow) search criteria, shown on the folded surface of a standard brain[48]. From left to right: left lateral, left medial, right medial and right lateral views. The corresponding lateral cerebellar surface is shown below each lateral cortical surface. Voxels meeting the *a priori* threshold outside of the search space are not shown.

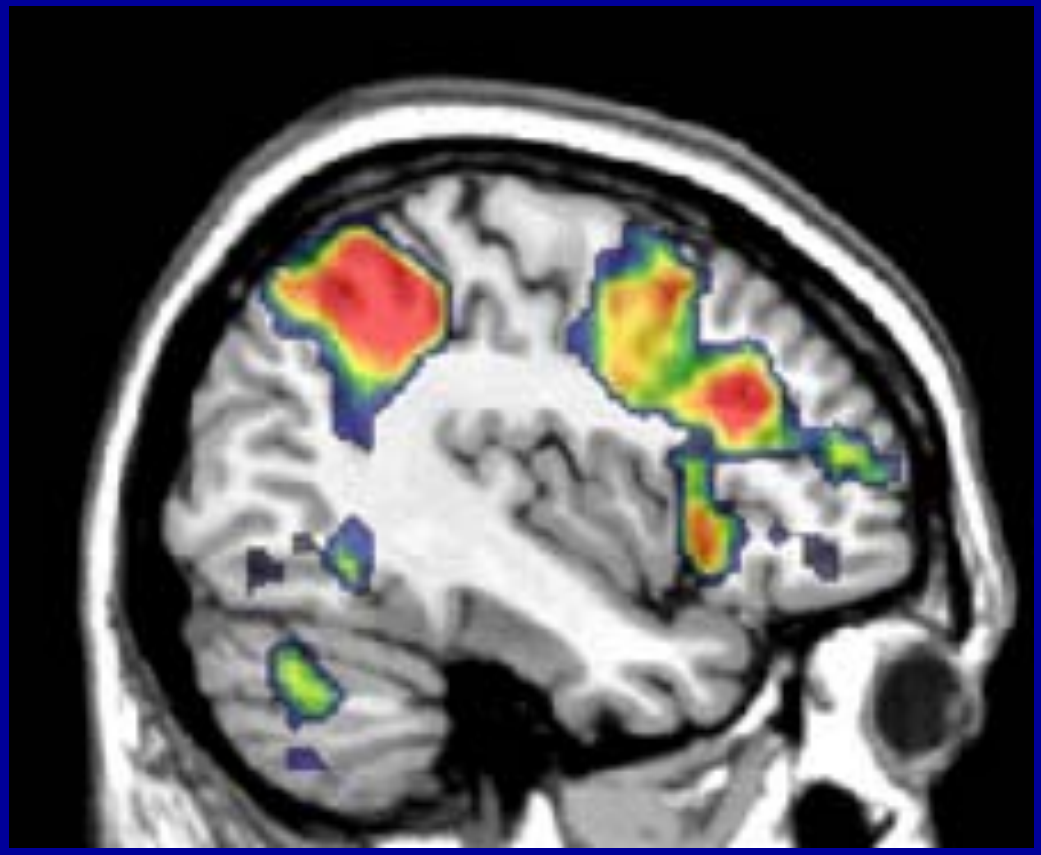




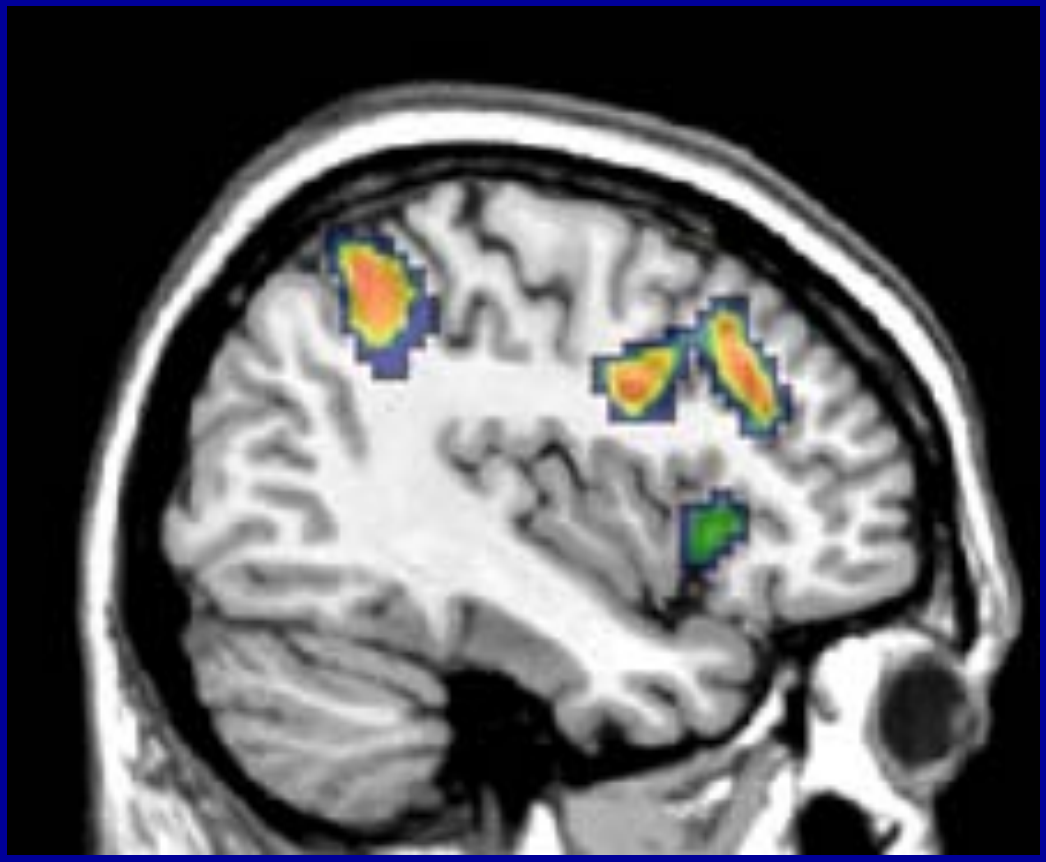
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GREATER DEMAND ON BRAN RESOURCES FOR LOWER IQ INDIVIDUALS

LOWER IQ (88-110)



HIGHER IQ (119-126)



Intelligence: Nature & Nurture

- identify genes
- identify experiential factors
- identify gene x environment interactions
- twin studies (shared genes)

Genetics & fMRI

SNPs - single nucleotide polymorphisms

- **DNA sequence variation of a single nucleotide**
 adenine (A), thymine (T), cytosine (C), guanine (G)
- **at least 1% of the population**
- **make up 90% of human genetic variation**
- **constant from generation to generation**

Two diagrams explaining Wisconsin Card Sorting Task removed due to copyright restrictions.

See lecture video.
Also refer to http://en.wikipedia.org/wiki/Wisconsin_card_sort

Cartoon illustrating the Wisconsin Card Sorting Task removed due to copyright restrictions.
Fig 12.4 in Gazzaniga, M. S., R. B. Ivry, and G. R. Mangun. *Cognitive Neuroscience*. 2nd edition. WW Norton & Co., 2002.

See lecture video.

W. W. Norton

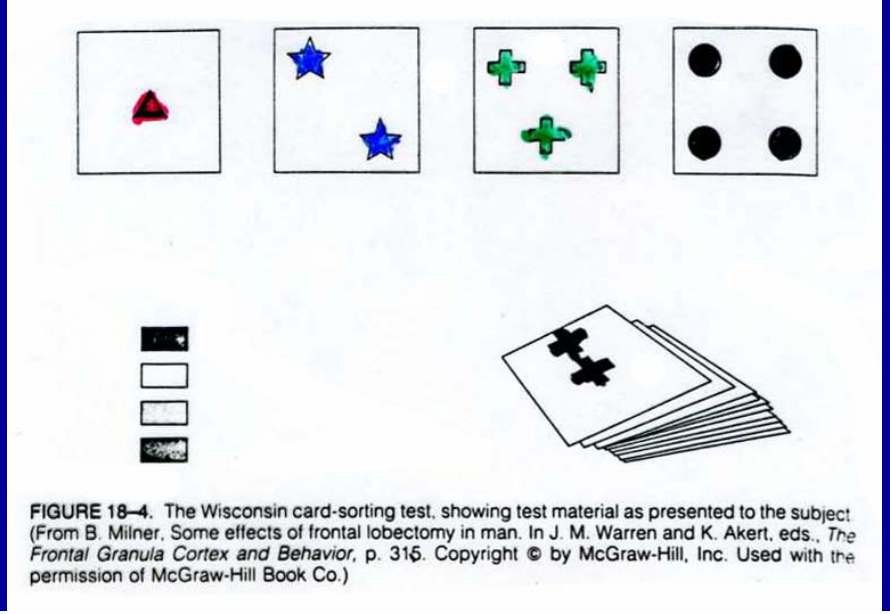
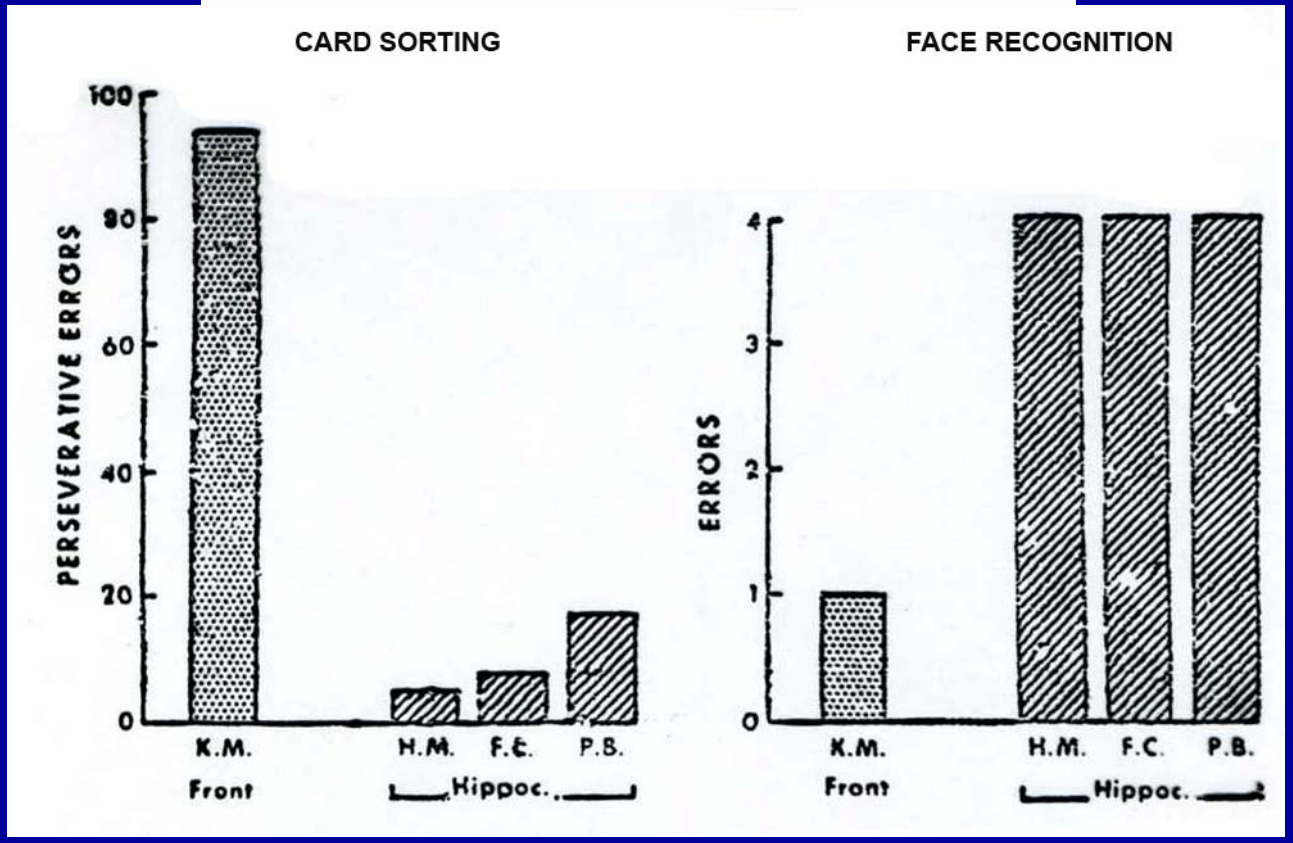


FIGURE 18–4. The Wisconsin card-sorting test, showing test material as presented to the subject. (From B. Milner, Some effects of frontal lobectomy in man. In J. M. Warren and K. Akert, eds., *The Frontal Granula Cortex and Behavior*, p. 315. Copyright © by McGraw-Hill, Inc. Used with the permission of McGraw-Hill Book Co.)



Source: Milner, B. "Some Effects of Frontal Lobectomy in Man." In *The Frontal Granula Cortex and Behavior*. Edited by J. M. Warren and K. Akert. McGraw-Hill, 1964. © McGraw-Hill. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Catechol-O-Methyltransferase (COMT)
(Egan et al., PNAS, 2001)

- risk factor for schizophrenia
- COMT metabolizes released dopamine (DA)
- single polymorphism – valine to methionine at codon 108/158 (val/val vs. val/met)
- Wisconsin Card Sorting Task (WCST)
- fMRI – N-back: 0-back & 2-back

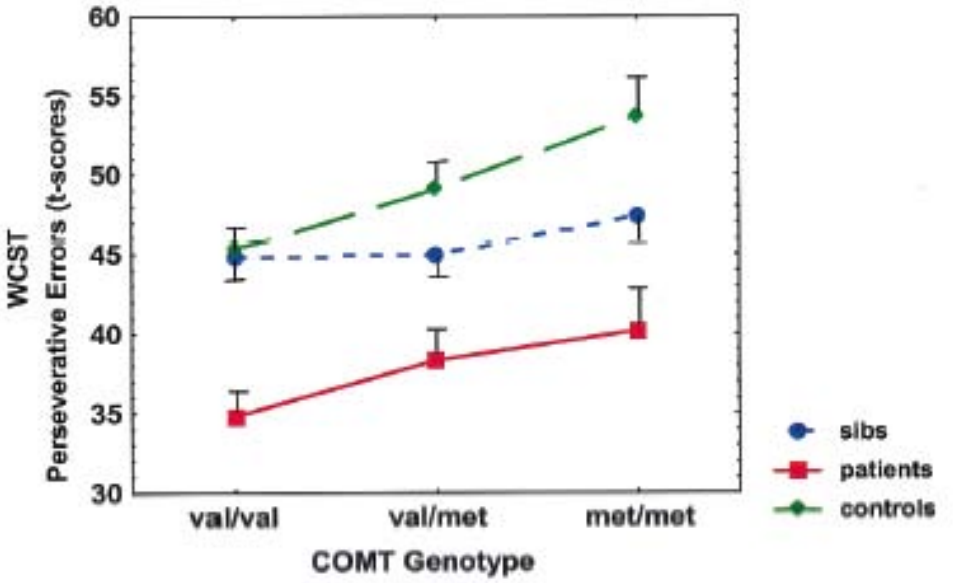


Fig. 1. WCST perseverative error *t* scores (± SE) by genotype for each group (population mean = 50, SD = 10, lower scores indicate worse performance). Main effect of genotype: $F = 4.93$, df = 2,224, $P = 0.008$.

Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Egan, M. F., et al. "Effect of COMT Val108/158 Met Genotype on Frontal Lobe Function and Risk for Schizophrenia." *PNAS* 98, no. 12 (2001): 6917-22. Copyright © 2001 National Academy of Sciences, U.S.A.

N-Back Task

Increasing Prefrontal Activation for Increasing N-Back

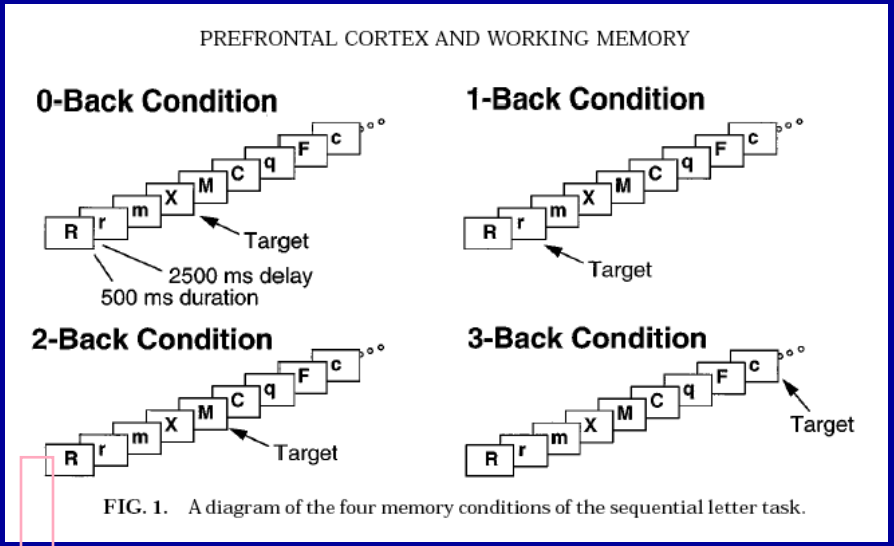


FIG. 1. A diagram of the four memory conditions of the sequential letter task.

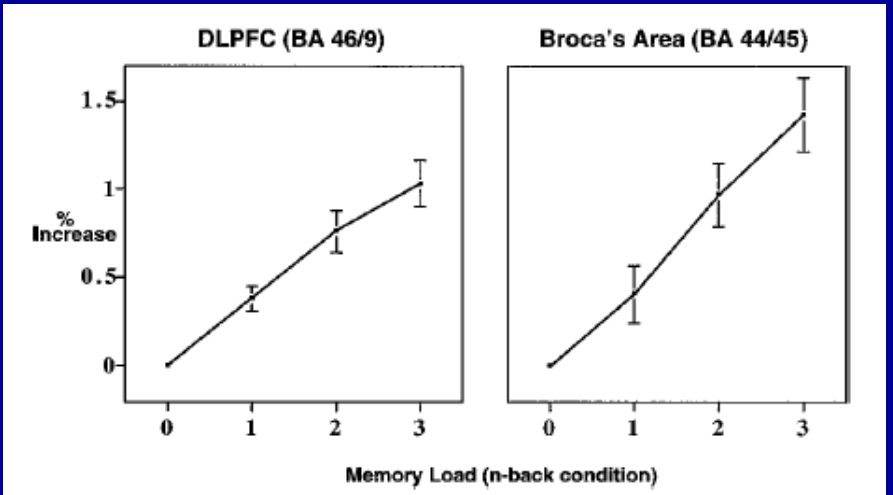


FIG. 3. Plots of the MR signal, expressed as a percentage of difference from the 0-back condition, across the four load conditions. Values are plotted for the MFG region (Talairach coordinates L38,30,22 and R35,22,27) and the IFG region (Talairach coordinates L40,6,26), the only two regions which showed a significant monotonic effect of load. The activity was averaged across the nine subjects; however, each subject showed essentially the same linear relationship to load.

Source: Braver, T. S., et al. "A Parametric Study of Prefrontal Cortex Involvement in Human Working Memory." *NeuroImage* 5, no. 1 (1997): 49-62. Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

Val/Val > Val/Met > Met/Met:

More activation = working harder to achieve same performance

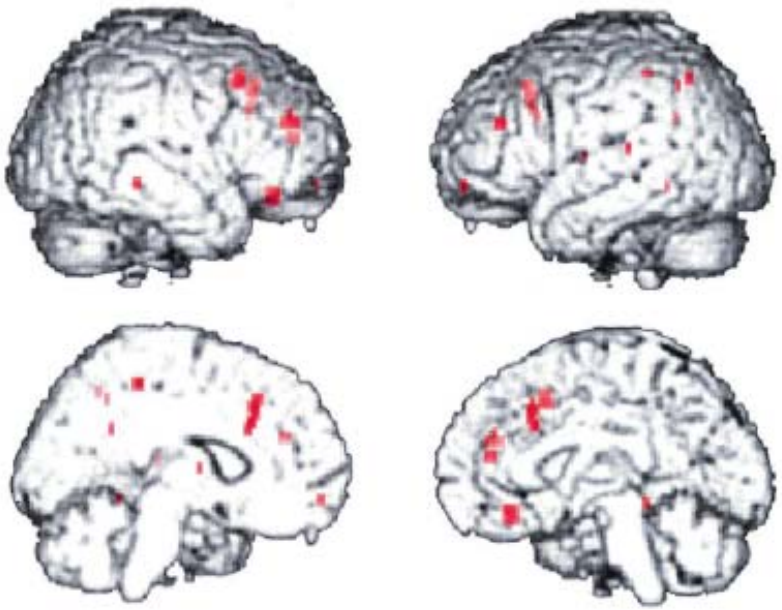


Fig. 2. Effect of COMT genotype on fMRI activation during the two-back working memory task. Regions showing a significant effect of genotype on fMRI activation (voxelwise $P < 0.005$) are in red (shown clockwise from upper left in right lateral, left lateral, right medial, and left medial views, respectively). In dorsolateral prefrontal cortex (e.g., Brodmann area 46; $x = 58$, $y = 32$, $z = 12$; cluster size = 47; $Z = 2.55$) and anterior cingulate (e.g., Brodmann 32; $x = 6$, $y = 60$, $z = 8$; cluster size = 77; $Z = 2.36$), Val/Val individuals showed a greater fMRI response (and by inference, greater inefficiency, as performance is similar) than Val/Met individuals who have greater activation than Met/Met individuals. Post hoc analysis of genotype group contrasts confirmed these significant relationships in dorsolateral prefrontal and cingulate cortices across all groups.

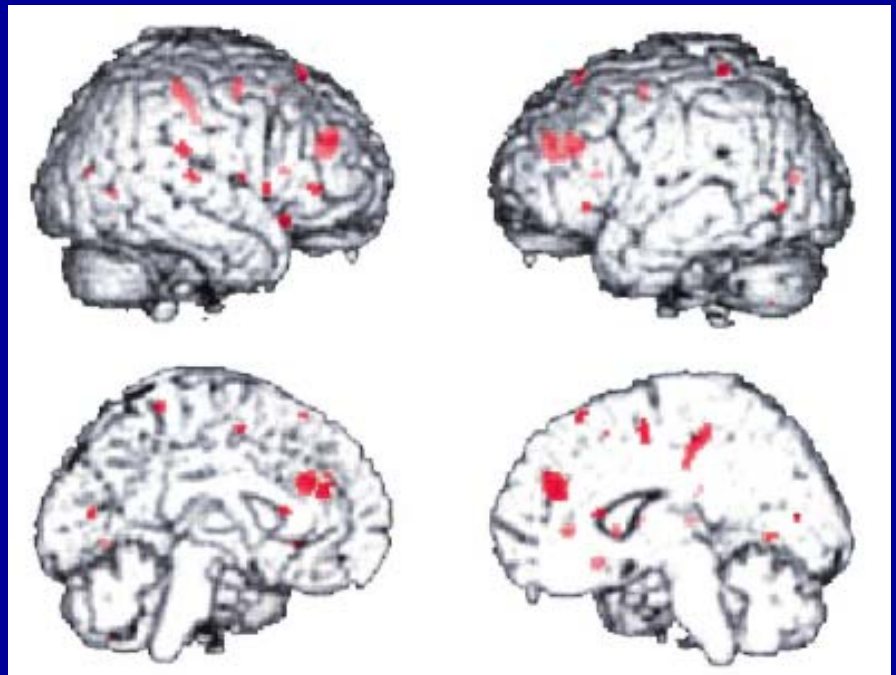


Fig. 3. Effect of COMT genotype on fMRI activation during the two-back working memory task in a second group of subjects. Again, Val/Val individuals showed greater activation (and by inference greater inefficiency) than Val/Met individuals who showed less efficiency than Met/Met individuals in the dorsal prefrontal cortex and several other locales.

Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Egan, M. F., et al. "Effect of COMT Val108/158 Met Genotype on Frontal Lobe Function and Risk for Schizophrenia." *PNAS* 98, no. 12 (2001): 6917-22. Copyright © 2001 National Academy of Sciences, U.S.A.

Intelligence: Nature & Nurture

?

Intelligence: Nature & Nurture

- twin studies (shared genes)
- behavioral genetics
- heritability
 - variability due to genetics
 - height may be 90% heritable in US
- twin studies
 - monozygotic - same genes
 - dizygotic - about half the genes

Fraternal and Identical Twins

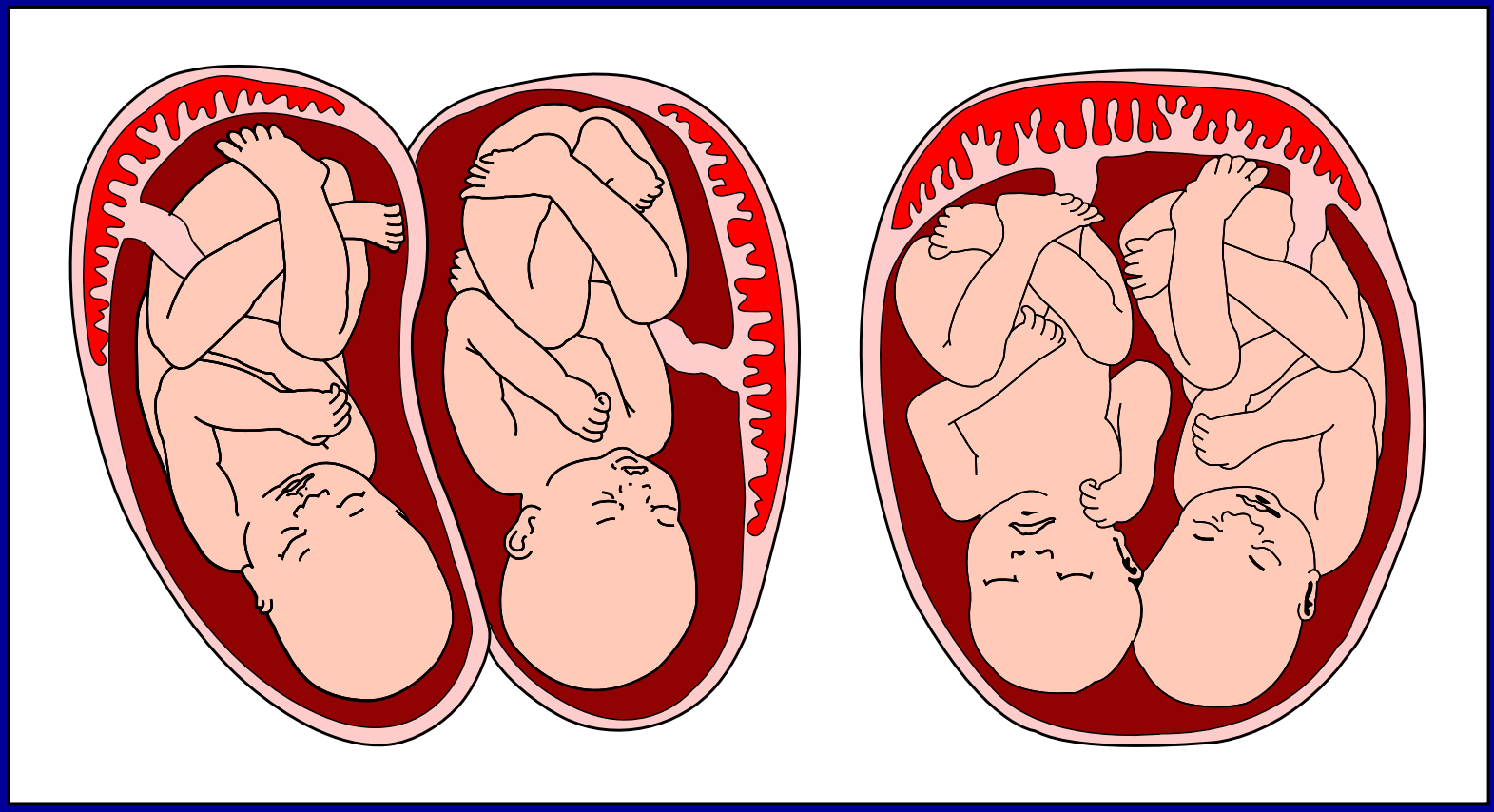


Image by MIT OpenCourseWare.

Correlation Between IQ Scores for People with Various Relationships

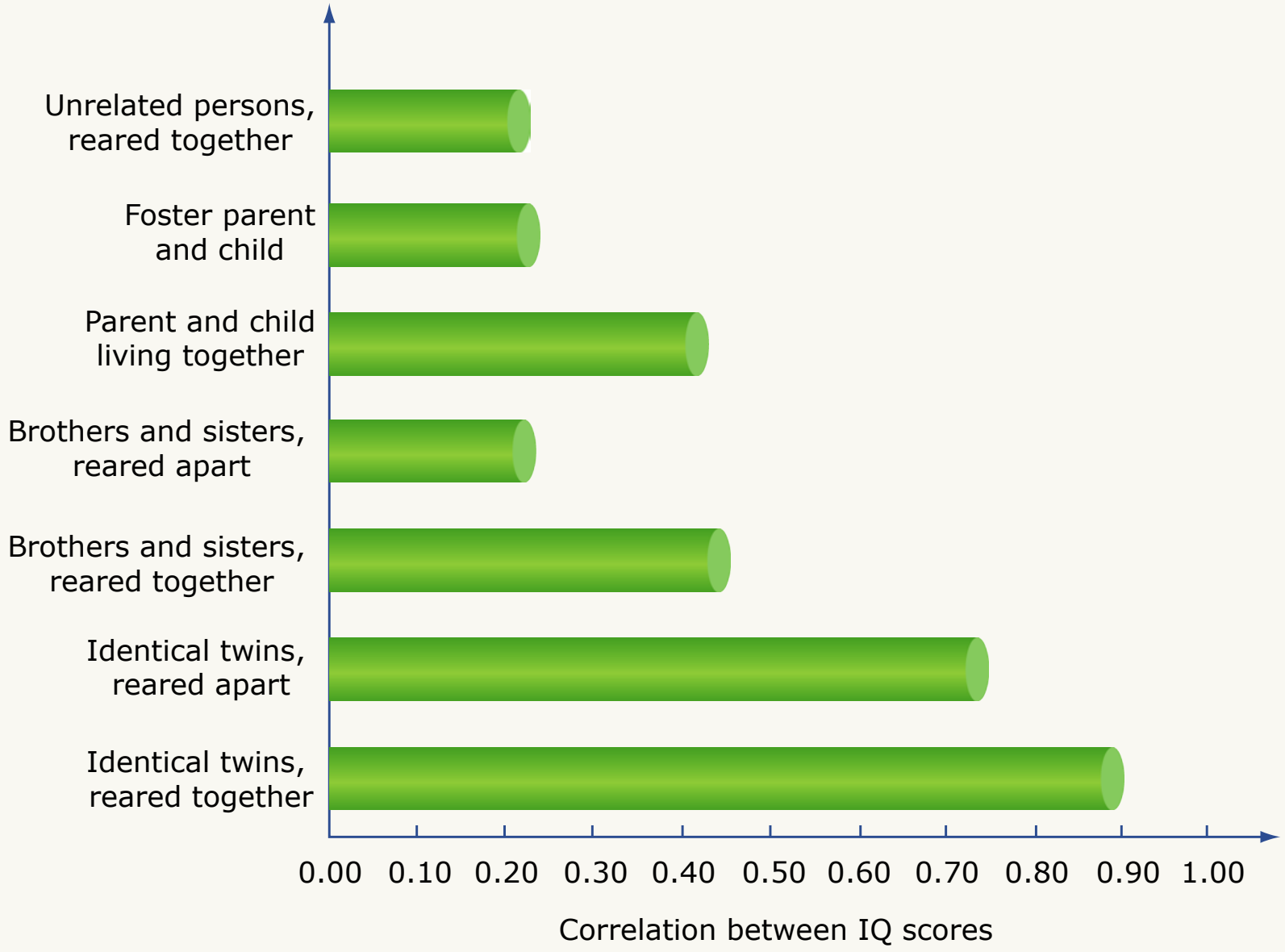


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Intelligence: Nature & Nurture

- heritability = about .50

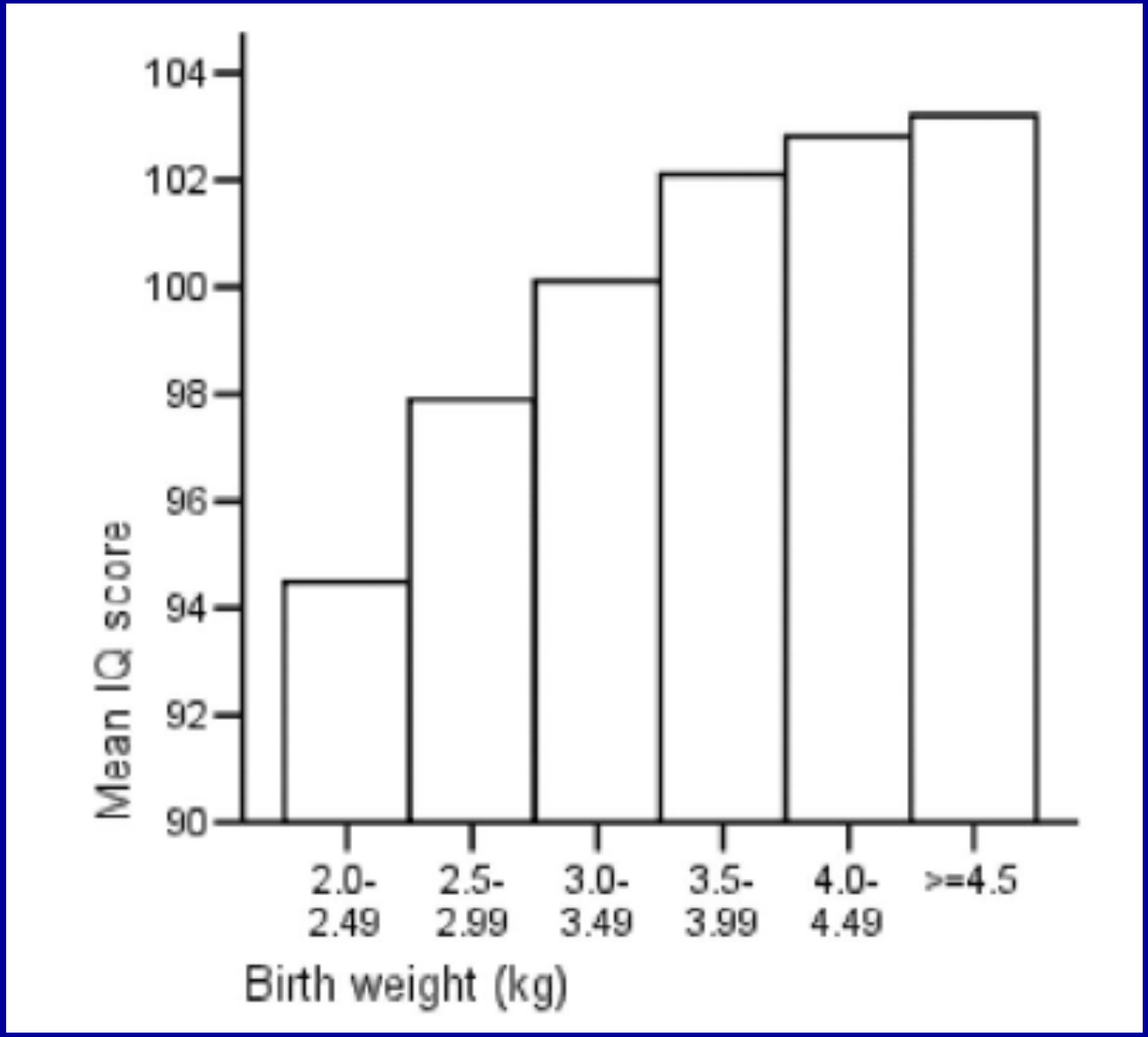
- environmental influences

 breastfeeding
 birth weight
 birth order & family size

Intelligence: Nature & Nurture

- 3000 people followed from birth to young adulthood - breastfeeding for at least 6 months correlated with 5-7 point IQ gain

IQ vs. Birth Weight



Courtesy of American Psychological Association. Used with permission. Source: Shenkin, S. D., et al. "Birth Weight and Cognitive Ability in Childhood: A Systematic Review." *Psychological Bulletin* 130, no. 6 (2004): 989-1013.

Genetic diversity affects heritability

Height is 90% heritable

Japanese men are 3 inches taller in US than in Japan

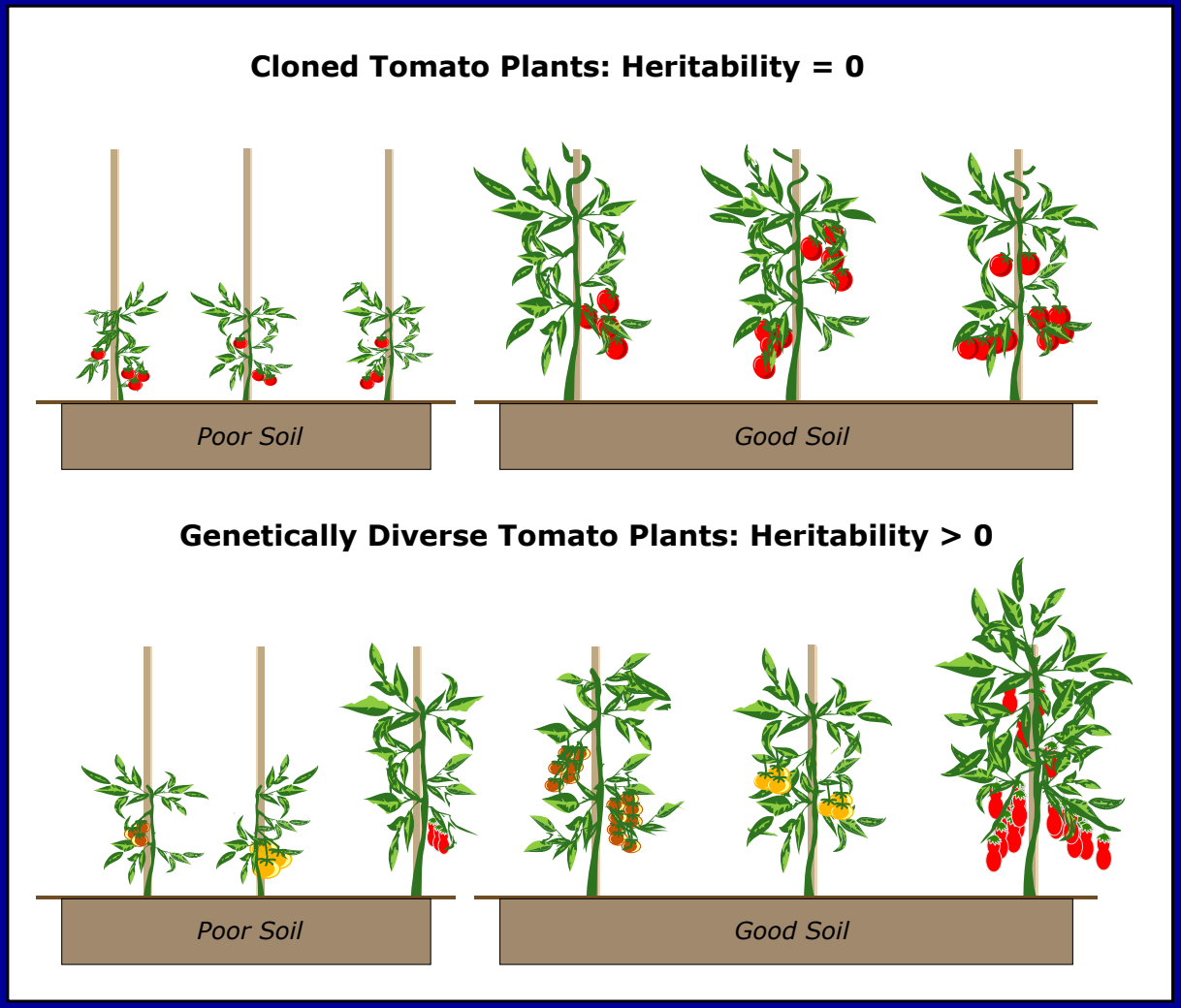
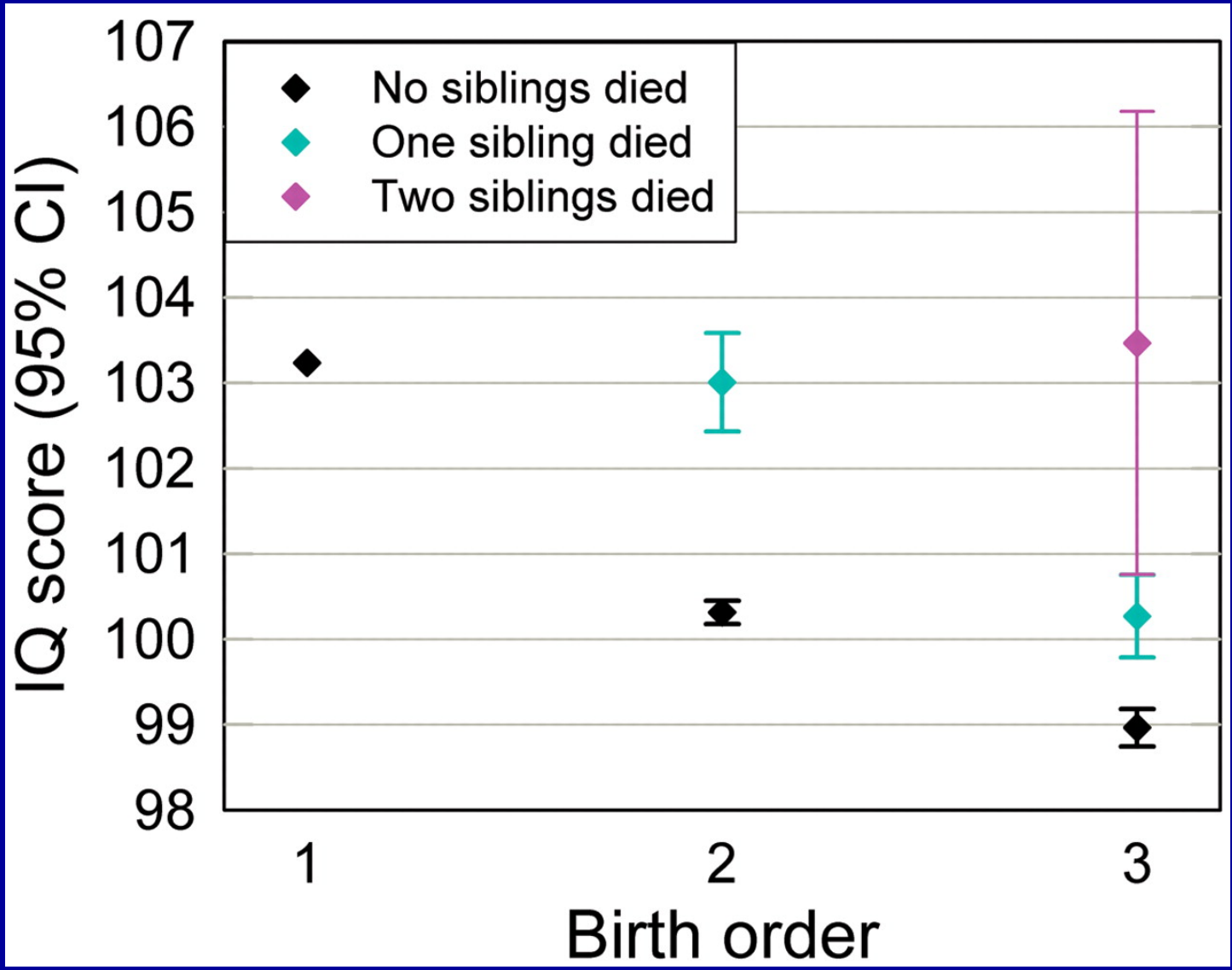


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Relation between birth order and IQ score. Mean IQ scores for male conscripts, first-, second-, and thirdborn in Norway to mothers with single births only and first birth from 1967 through 1976, according to birth order and number of elder siblings who died in infancy (age < 1 year). Scores are adjusted for parental education level, maternal age at birth, sibship size, birth weight, and year of conscription. Error bars show 95% confidence intervals (CIs). Reference: birth order one.

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Birth Order Family Size & Raven scores

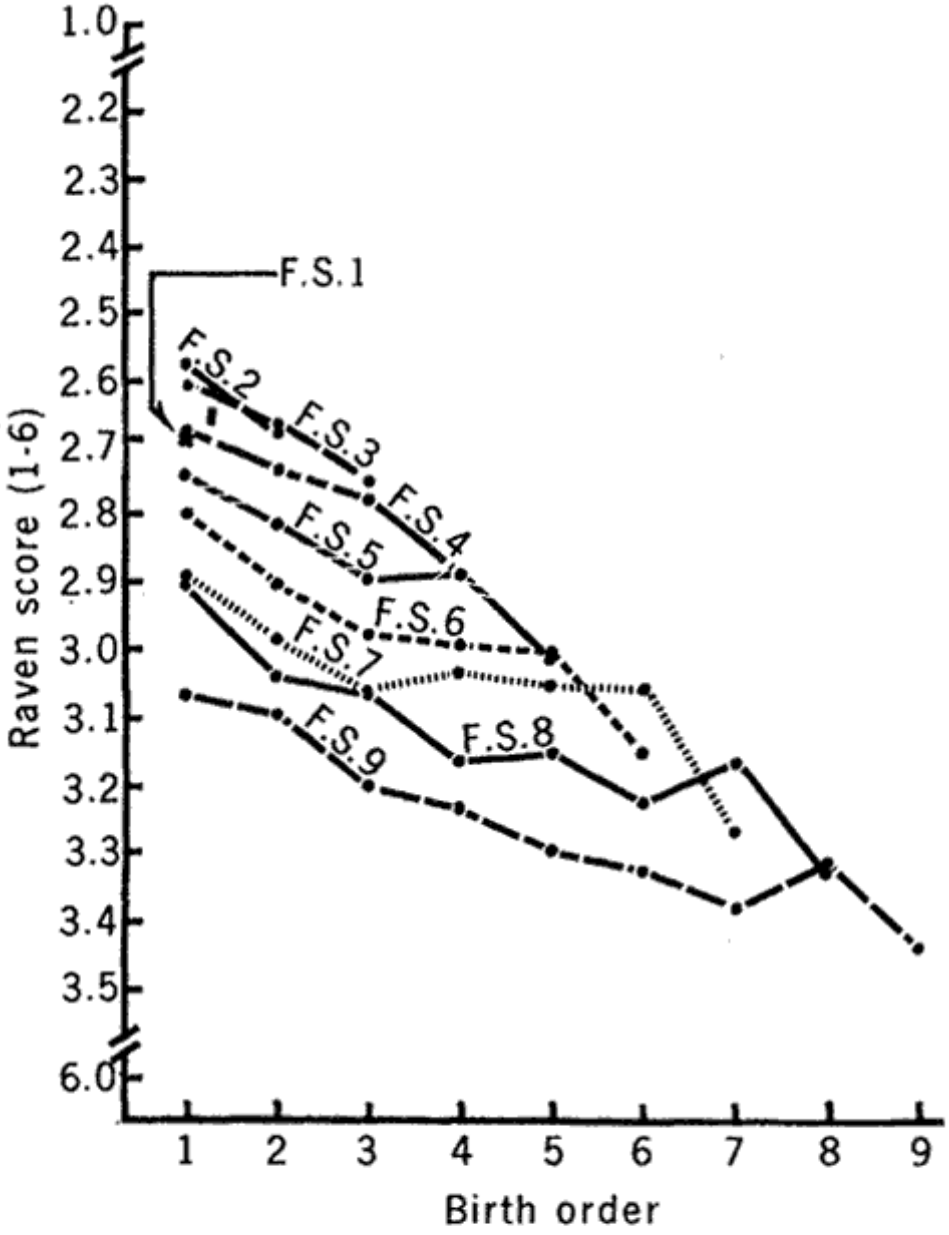


Fig. 1. Mean Raven class score by birth order within family size (*F.S.*) across the population ($N = 386{,}114$).

Source: Belmont, L, and F. A. Marolla. *Science* 182, no. 4117 (1973): 1096-101. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

FAMILY DYNAMICS OF INTELLECTUAL DEVELOPMENT

- birth order, family size (Zajonc)
- confluence model

 first born exposed only to adult language

 second born to parents plus first born, etc.

 also opportunity to tutor younger sibs

FAMILY DYNAMICS OF INTELLECTUAL DEVELOPMENT

- birth order, family size (Zajonc)
- confluence model

 1st - (30 + 30 + 0)/3 = 20

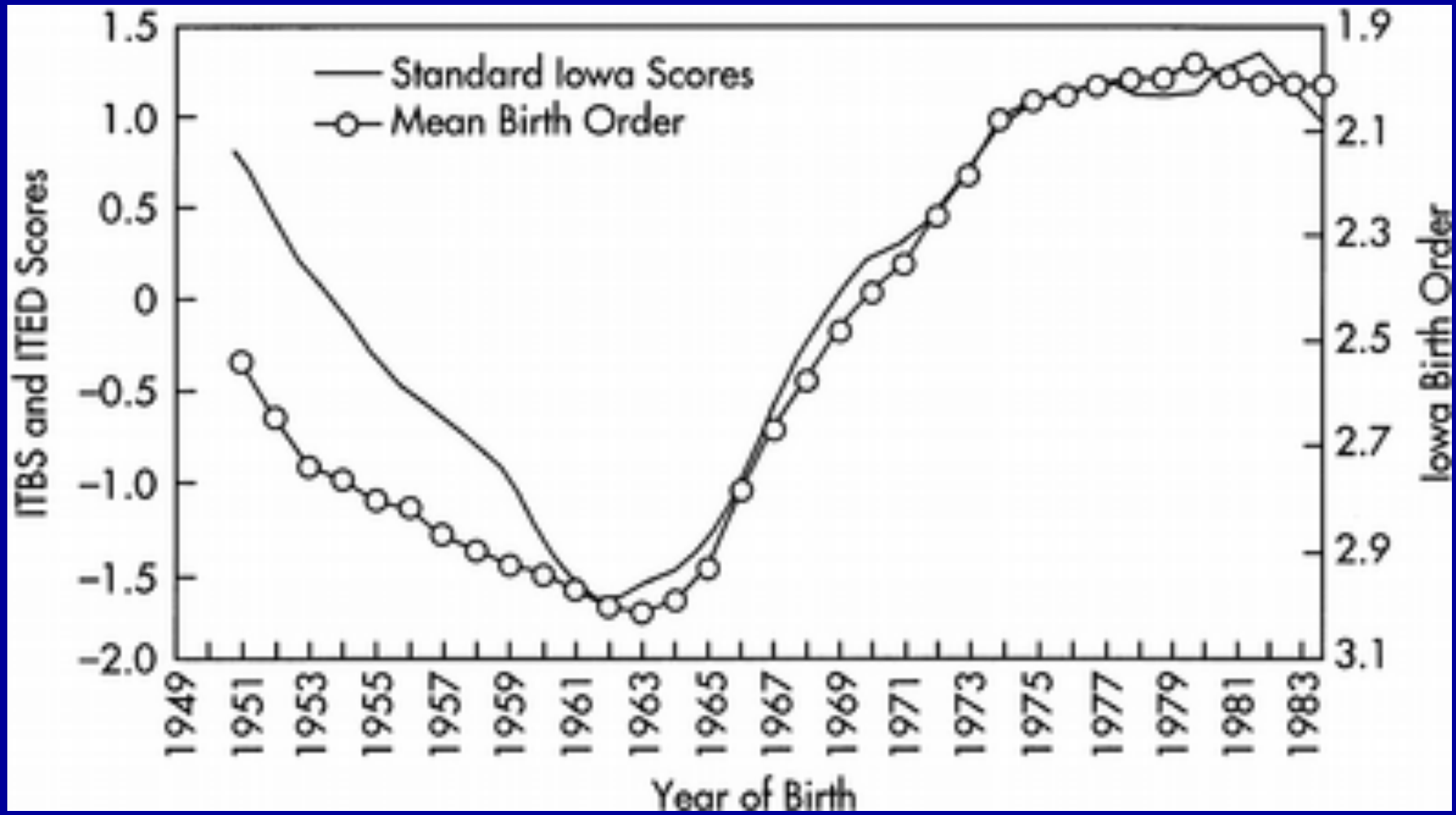
 2nd - (30 + 30 + 4 + 0)/4 = 16

 3d - (30 + 30 + 7 + 3 + 0)/5 = 14

 test at 8

 1st - (30 + 30 + 8 + 4)/4 = 18

 2nd - (30 + 30 + 12 + 8)/4 = 20



Birth Order and Iowa Basic Skills Scores

The birth order scale is inverted such that higher numerical values represent lower birth ranks. ITBS = Iowa Tests of Basic Skills; ITED = Iowa Test of Educational Development.

Source: Zajonc, R. B. "The Family Dynamics of Intellectual Development." *American Psychologist* 56, no. 6-7 (2001): 490-6. Courtesy of the American Psychological Association. Used with permission.

EARLY EXPOSURE TO LANGUAGE

- Hart & Risley - record each month for 2.5 years one full hour of every word spoken at home between parent and child in 42 families, categorized as professional, working class, or welfare families (SES) - code and analyze every utterance in 1,318 transcripts - 30,000 pages

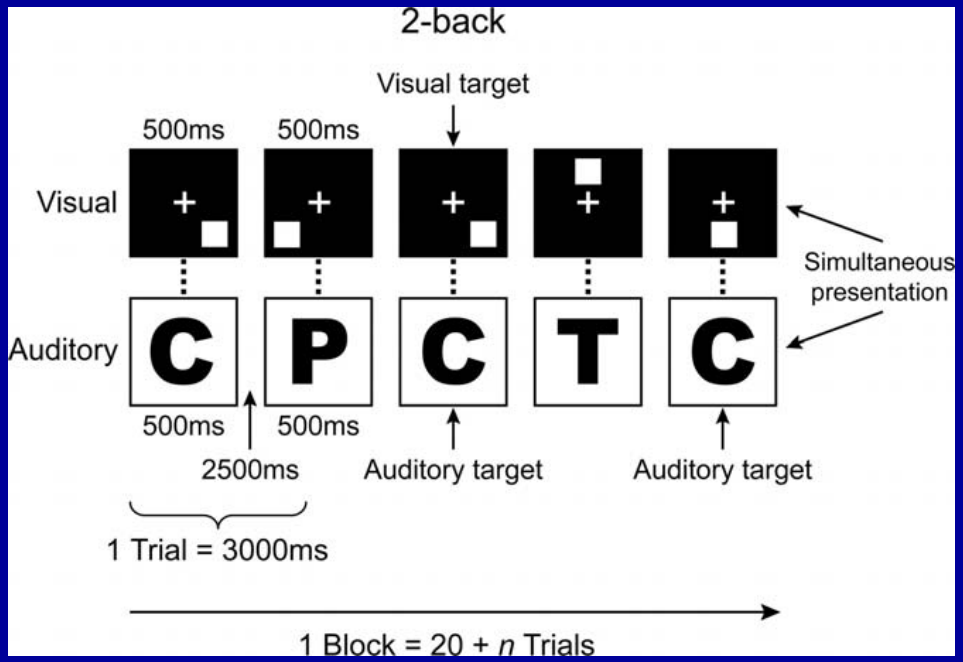
Key findings

- variation in children's IQ and language ability related to amount parents speak to children
- children's academic success at ages 9-10 related to amount of talk heard at ages 0-3

EARLY EXPOSURE TO LANGUAGE

- by age 3, cumulative vocabulary was 1100 words in professional family, 750 in working class family, 500 in welfare family
- welfare family = 616 words/hour; working class family = 750 words/hour; professional family = 2153 words/hour
- by age 3, vocabulary used was larger in children of professional parents than welfare parents
- 300 words more per hour for professional than welfare parents
- extrapolated to a year - child in professional family hears 11 million words vs. 3 million in welfare family
- strong correlation for children at age 9 in IQ

Training Up Your IQ

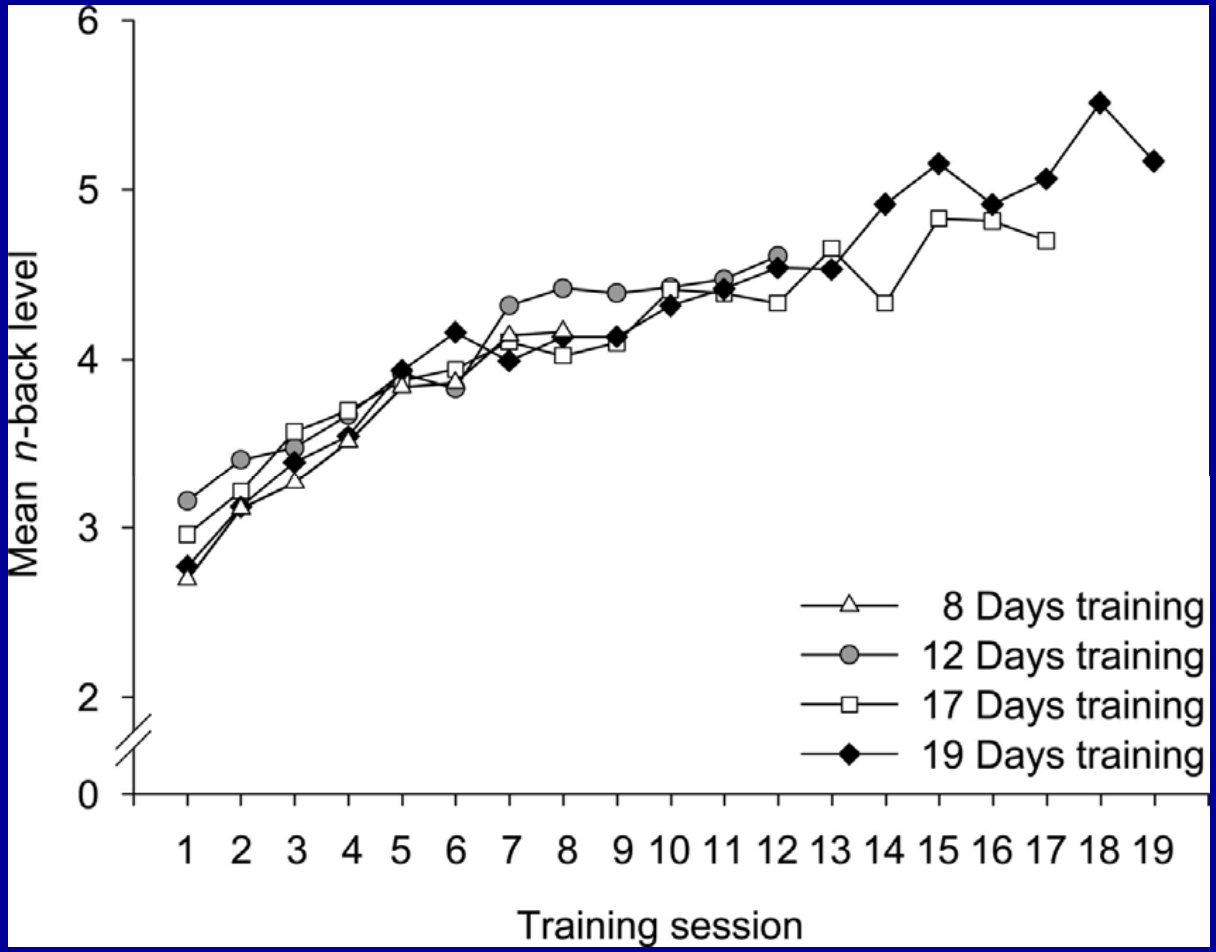


Jaeggi et.al. PNAS 2008

Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Jaeggi, S., et al. "Improving Fluid Intelligence with Training on Working Memory." *PNAS* 105, no. 19 (2008): 6829-33. Copyright © 2008 National Academy of Sciences, U.S.A.

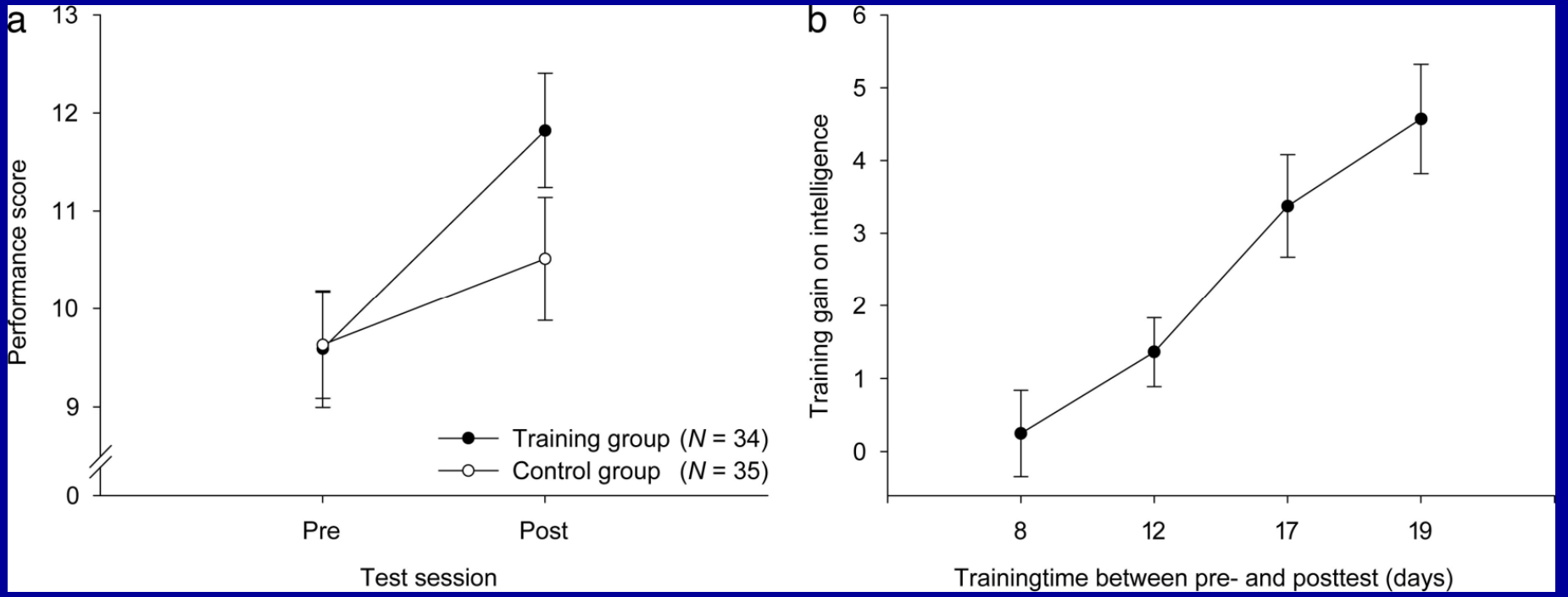
- **34 trained subjects, 35 controls**
- **daily training (between 8 and 19 days), skipping weekends, 25 minutes per day**
- **trained adaptively on dual n-back task;**
- **tested on Raven's Progressive Matrices/BOMAT**

Training Up Your Working Memory



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Training Up Your IQ



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Intelligence: Group Differences

- history of racism, sexism
 - US immigration Act of 1924
 - “biologically weak stocks”
 - Italians, Jews from Europe

99.9% genetic similarity - is “race” a biologically meaningful category?

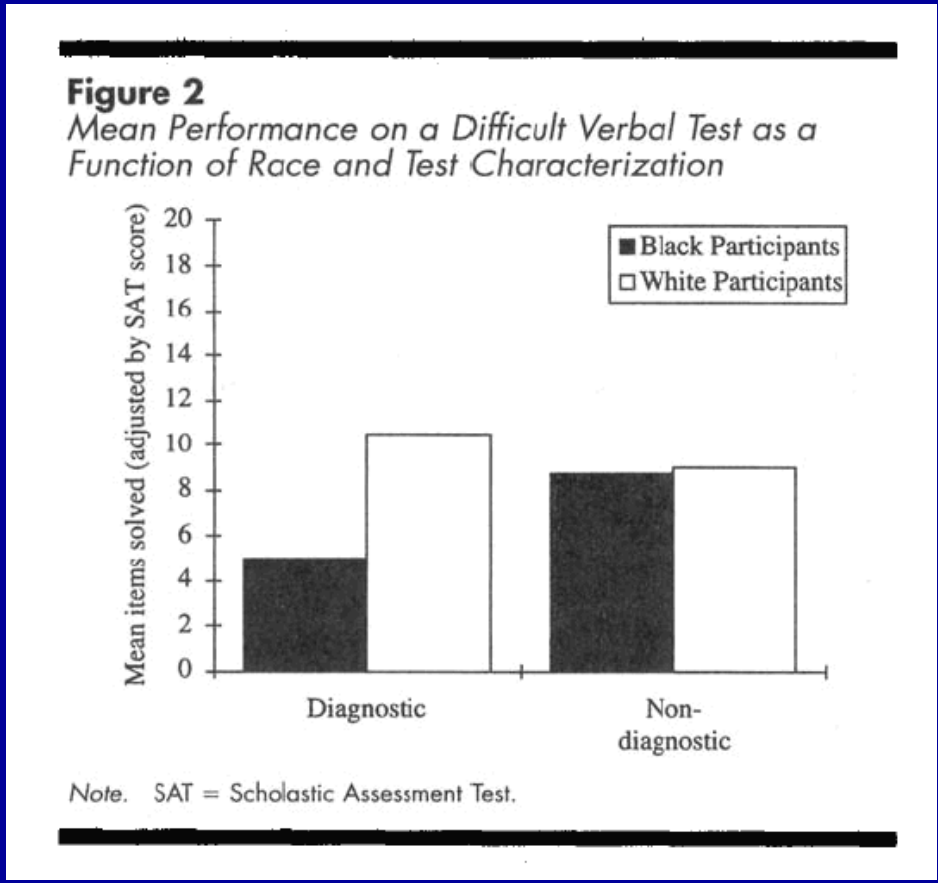
Black-White Gap in US

- infancy - no difference
- age 4 - 4.5 points difference
- ages 4-24, 0.6/year, 83.4
- children fathered by black American GIs in Germany (WWII) brought up by German mothers same IQ as children of white American GIs and German mothers
- median household income

white ($50,700); black ($32,000); Hispanic ($37,800)

Stereotype Threat

- Claude Steele
verbal GRE items
blacks & whites
"laboratory experiment"
- equal scores
"test of intelligence"
-worse performance
-by blacks
- List race
laboratory experiment –
worse performance by
blacks



Source: Steele, C. M. "A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance." *American Psychologist* 52, no. 6 (1997): 613-29. Courtesy of the American Psychological Association. Used with permission.

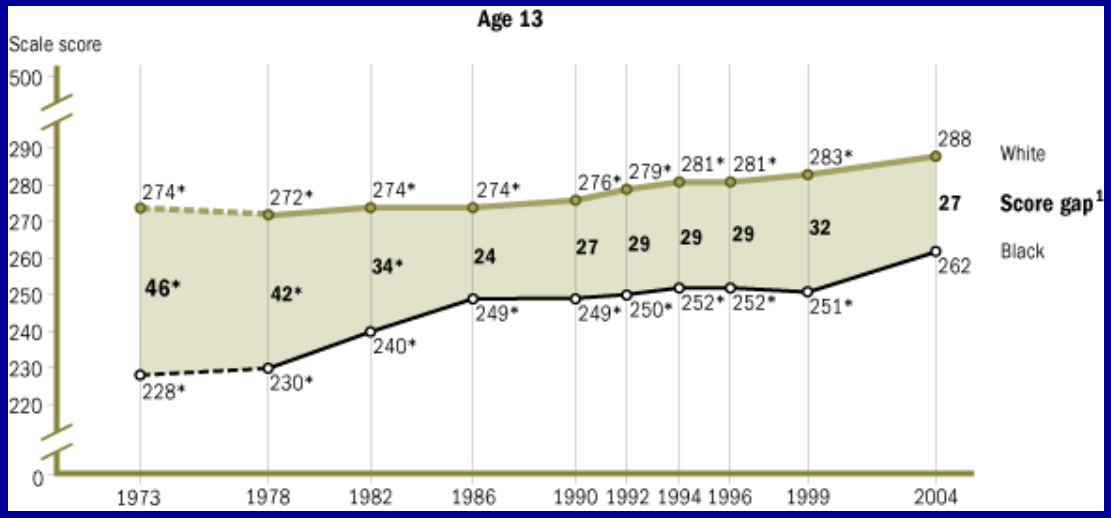
Stereotype Threat

threat that others' judgments or one's own actions will confirm negative stereotypes about one's group

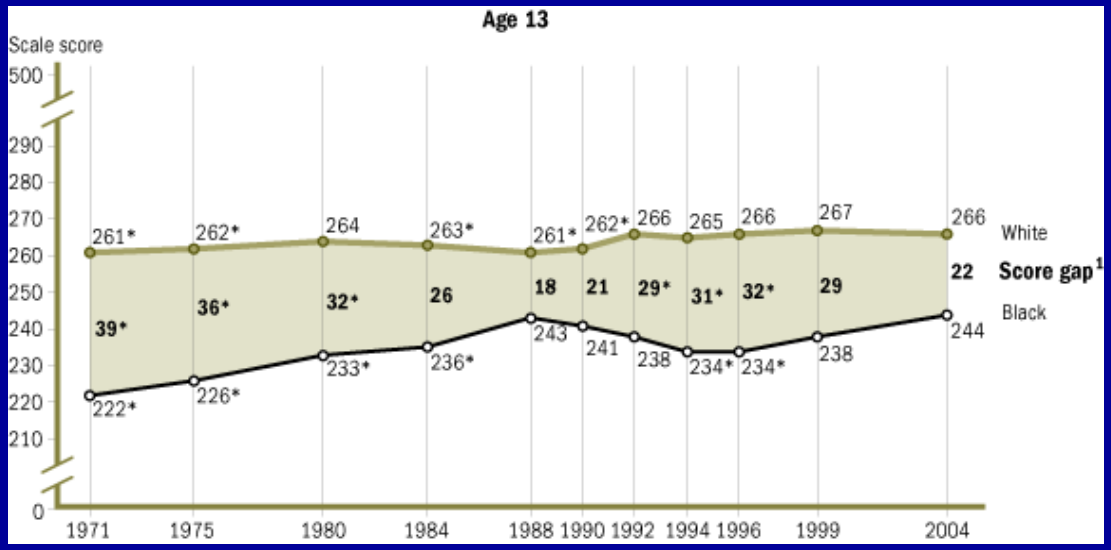
- women on math tests
- old people
- homosexual men
- athletic ability

- effects are greater with stronger group identification, importance of ability, or personally stigmatized

The Achievement Gap



NAEP trends in average mathematics scores and score gaps



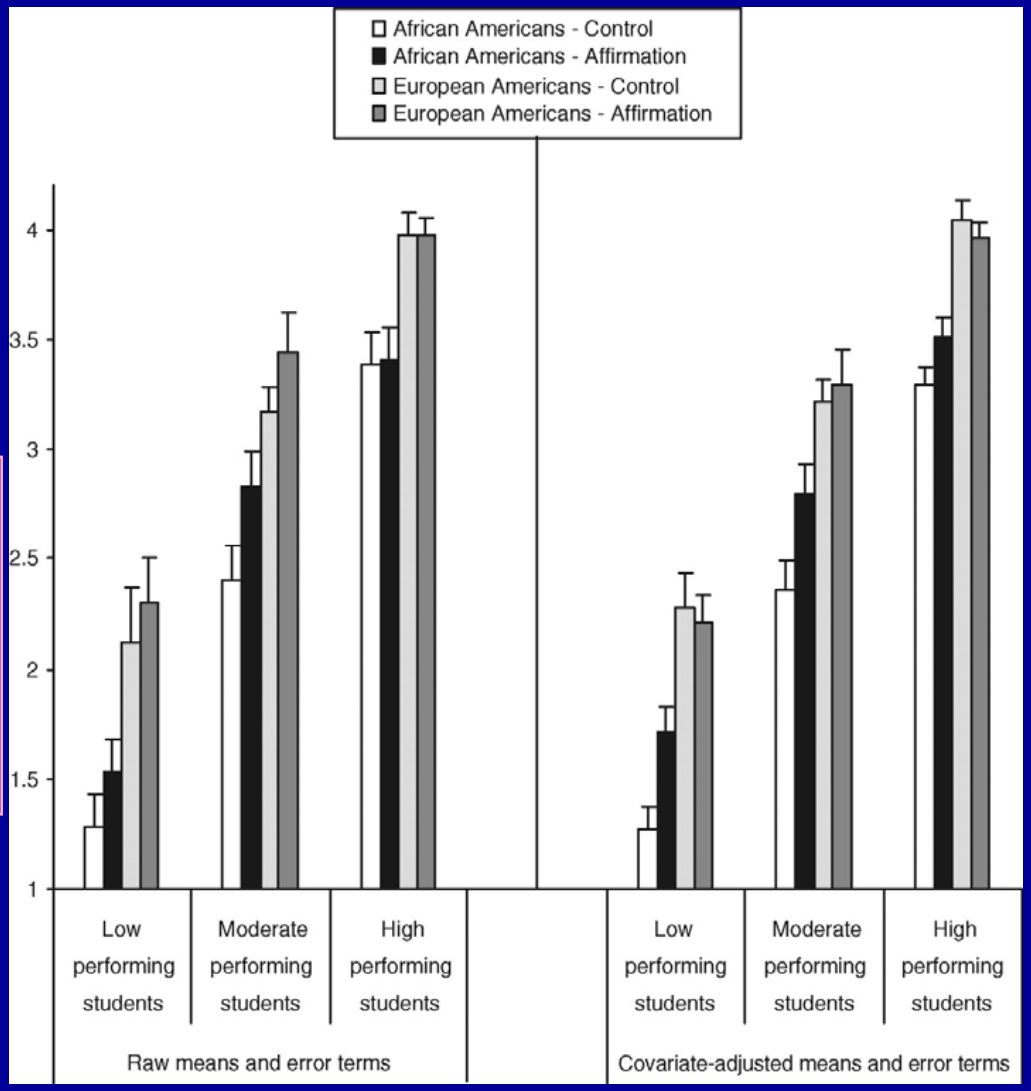
NAEP trends in average reading scores and score gaps

- "Nat'l Assessment of Ed. Progress (NAEP) also known as 'the Nation's Report Card,' is the only nationally representative and continuing assessment of what America's students know and can do in various subject areas…"

- In 2004, NAEP administered the latest long-term trend assessment to approximately 75,000 students at ages 9, 13, and 17 in public and nonpublic schools throughout the nation.

Source: U. S. National Assessment of Educational Progress (NAEP), http://nces.ed.gov/nationsreportcard/studies/gaps/.

Does Stereotype Threat Intervention Decrease the Achievement Gap?



- 119 African American and 124 white 7th graders from middle- to lower-class families at a suburban northeastern middle school
- Affirmation: choose a value from a list and write an in-class essay about why the chosen value is important to *you*
- Control: choose a value from the same list and write an in-class essay about why the chosen value might be important to *someone else*
- African Americans in affirmation group had G.P.A.s .30 pts higher than their control counterparts, but no effect was seen for the white students in the affirmation group…

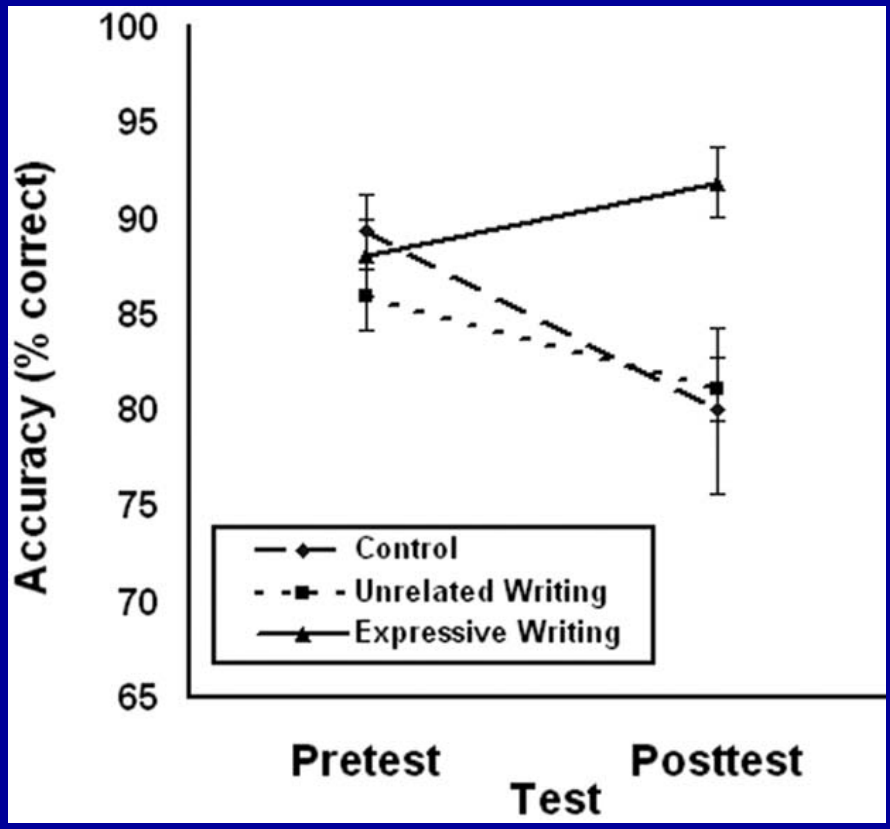
Affirmation reduced the achievement gap by 40%!

Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006) "Reducing the racial achievement gap: A social-psychological intervention." *Science* , *313*, 1307-1310.

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Writing About Testing Worries Boosts Exam Performance in the Classroom

Gauss's modular arithmetic
Take test (pretest)
Can earn monetary award with partner; partner had already improved;
Performance to be videotaped and evaluated; (pressure/anxiety)
10 minutes
- Control = sit quietly (7% worse)
- Expressive = write about thoughts/feelings (4% better)
- Unrelated writing (7% better)



[Corrected from video]

Ramirez & Beilock, Science, 2011

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Entity vs. Growth/Incremental

- how much does ability come from genes or the past (entity) vs. effort/practice (growth)?
- Carol Dweck

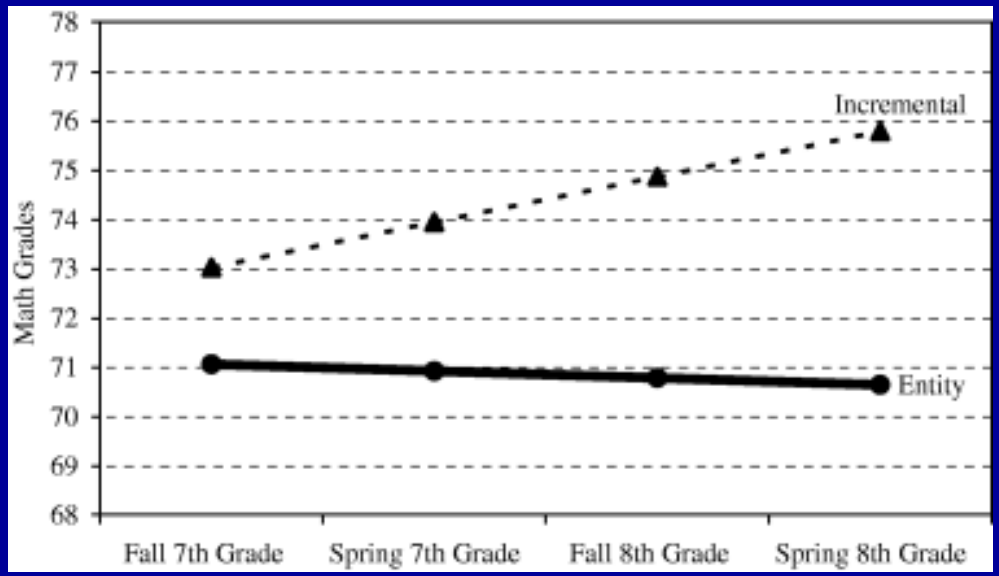
Implicit Theories of Intelligence Sample Questions

Strongly Agree	*Agree*	*Mostly Agree*	*Mostly Disagree*	*Disagree*	*Strongly Disagree*
1	*2*	*3*	*4*	*5*	*6*

1. ***You have a certain amount of intelligence, and you really can't do much to change it.***
2. ***Your intelligence is something about you that you can't change very much.***
3. ***You can learn new things, but you can't really change your basic intelligence.***

Entity vs. Growth/Incremental

- theory of intelligence & adolescents' mathematics achievement
- belief that intelligence can grow associated with gains on math grades
- belief that intelligence is fixed associated with no gains on math grades

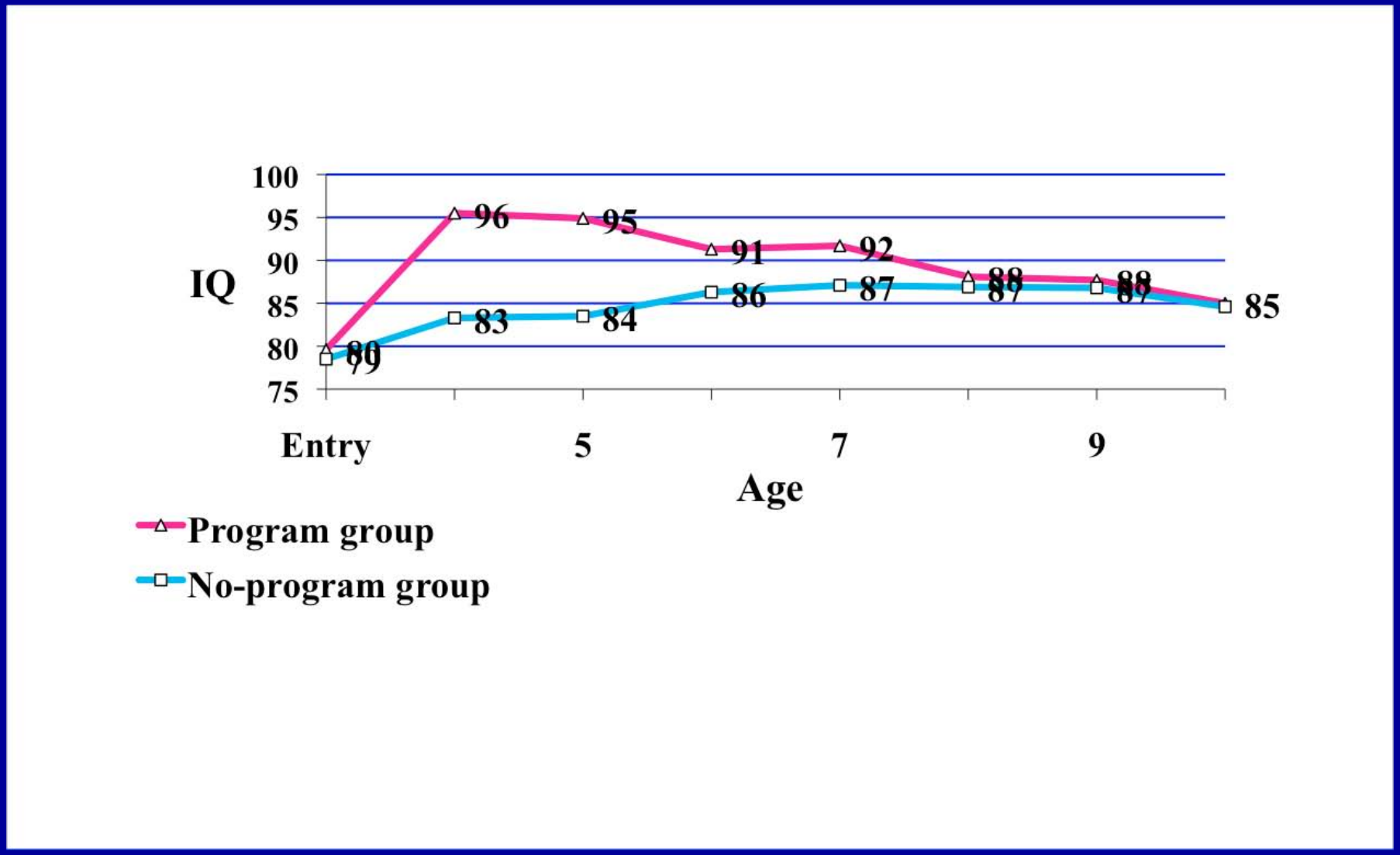


Source: Blackwell, L. S., K. H. Trzesniewski, and C. S. Dweck. *Child Development* 78, no. 1 (2007): 246–63. © John Wiley And Sons Inc. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Perry Preschool Study – Lifelong Success After Fleeting Test Score Gains

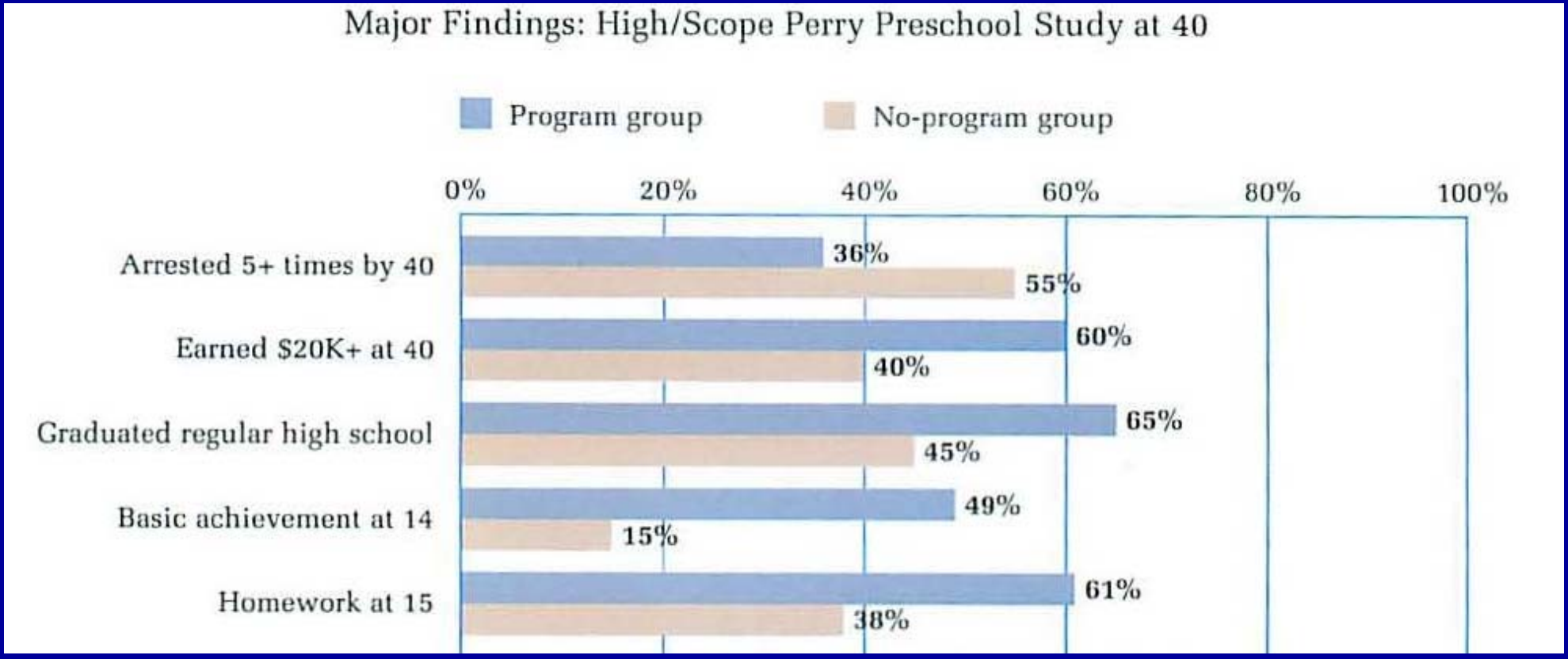
- followed into adulthood 123 low SE children from African American families from around Perry Preschool in Ypsilanti, Michigan, in 1962
- youngsters participating in study were randomly divided into a *program group*, who received a high-quality, active learning preschool program and home visits, and a *no-program group*, who received no preschool program
- status of the two groups assessed annually from ages 3 to 11, at ages 14-15, at age 19, age 27 and again at age 40
- rare random-assignment, longitudinal study

Perry Preschool IQ Over Time



Program benefits seem to disappear over time, but…

Major Benefits in Important Life Outcomes



From *Lifetime Effects: The HighScope Perry Preschool Study Through Age 40* (page XV) by Schweinhart, L., Montie, J., Xiang, Z., Barnett, S., Belfield, C., Nores, M. Ypsilanti, MI: HighScope Press © 2005, HighScope Educational Research Foundation. Used with permission.

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9.00SC Introduction to Psychology
Fall 2011

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EMOTION

9.00

John Gabrieli

EMOTION

- A brief history
- Defining emotion
- Models of emotion
- Burning questions and tentative answers
 - Are emotions universal?
 - Do emotions have unique physiological signatures?
 - Why do we have emotions?
- Brain basis of emotions

happy, **sad**, angry, **joyful**, moping,
nervous, **mad**, bored, irate
content, raging, awestruck, ***infatuated***
Seething, brave, timid, **DOUBTFUL**, **sorrowful**,
terrified, resentful, heart-broken,
elated, *agreeable*, scared, jealous,
exhausted, furious, **grief-stricken**, sorrowful,
captivated, disappointed, **anxious**, disgusted,
frustrated, surprised, enthralled, depressed
(550 words)

William James
1842 - 1910



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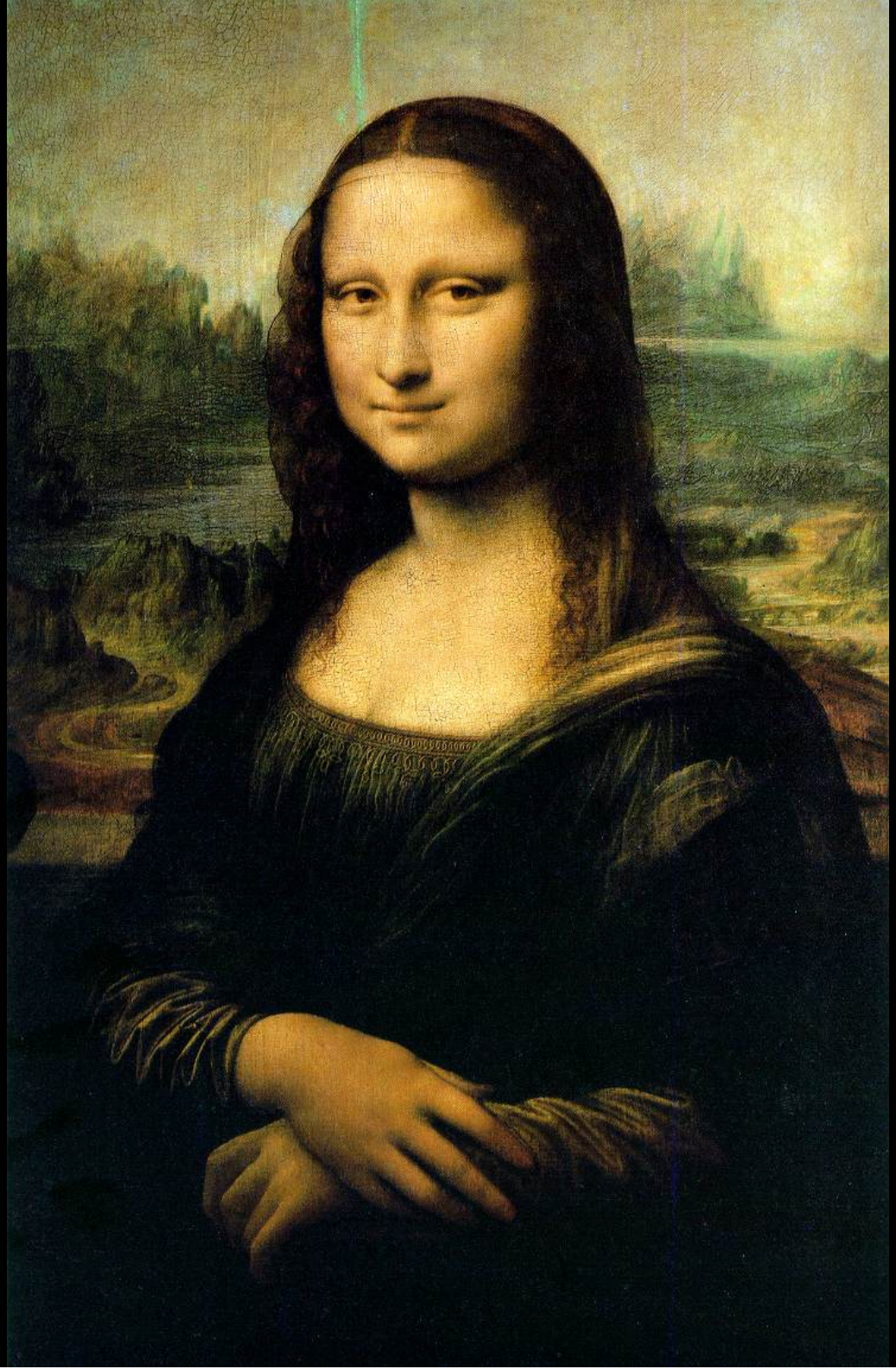
Emotion is Important

"*If you can conceive of yourself... suddenly stripped of all the emotion with which our world now inspires you... no one portion of the universe would then have importance beyond another; and the whole character of its things and series of its events would be without significance, character, expression, or perspective.*"

(James, 1890)

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Emotion



Public domain image.

Journals and Research on Emotion:

- Cognition & Emotion
- Consciousness & Emotion
- ISRE (International Society for Research on Emotion)
- Emotion (APA journal)

Definition of Emotion

Emotions are biologically-based responses to situations that are seen as personally relevant. They are shaped by learning, and usually involve changes in peripheral physiology, expressive behavior, and subjective experience.

EMOTION vs. MOOD

- *Mood* - diffuse, long-lasting emotional states

- *Emotion* - immediate responses to a specific object or situation

Dimensions of Emotion

- *Arousal*

 high - excited, tense

 low - calm, lethargic

- *Valence*

 positive - elated, contented

 negative - sad, gloomy

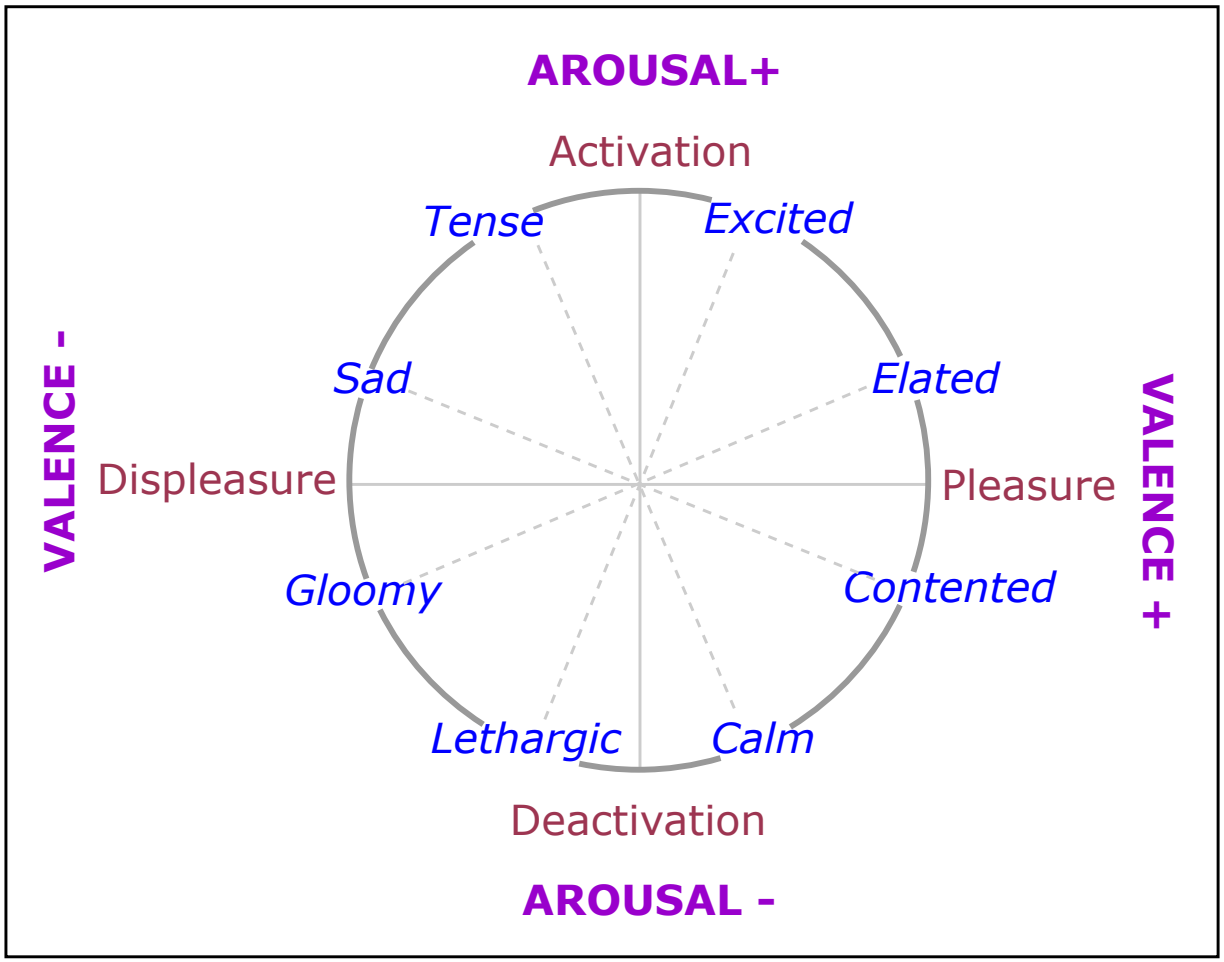


Image by MIT OpenCourseWare.

Basic affects are shown here arranged in a circle in which the vertical dimension represents degree of perceived arousal and the horizontal dimension represents degree of pleasure or displeasure.

Who Else Has Emotions?

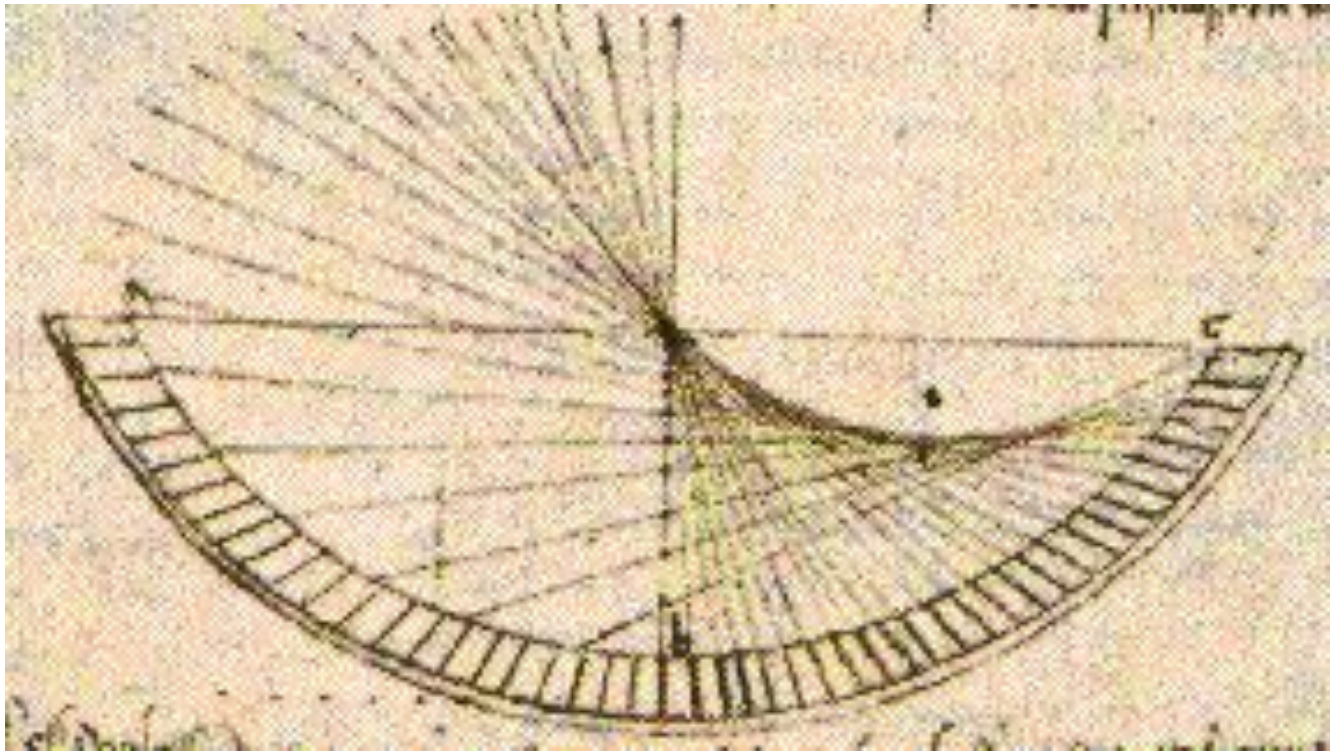
- Chimps?
- Dogs?
- Armadillos?

Images of animals showing emotion removed due to copyright restrictions.

Definition of Emotion

Emotions are biologically-based responses to situations that are seen as personally relevant. They are shaped by learning, and usually involve changes in peripheral physiology, expressive behavior, and subjective experience.

Models of Emotion



Theory	Stimulus	Response		Report
Common sense		FEAR Subjective experience	 Body response (arousal)	"My heart is pounding because I feel afraid."

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Theory	Stimulus	Response	Report
Common sense		 Subjective experience  Body response (arousal)	"My heart is pounding because I feel afraid."
James-Lange		 Body response (arousal)  Subjective experience	"I feel afraid because my heart is pounding."

"We feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we strike, cry, or tremble because we are sorry, angry, or fearful"

William James

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HOW CAN PERIPHERAL BODILY EVENTS INFLUENCE EMOTIONS?

- hold pencil tightly between teeth (forces smiling expression) or between lips (prevents smiling) while watching funny movie - smiling expression led to more enjoyment
- pose facial muscles (into smile or frown) - see pictures - then report feelings - frown expression reported more anger and less happiness

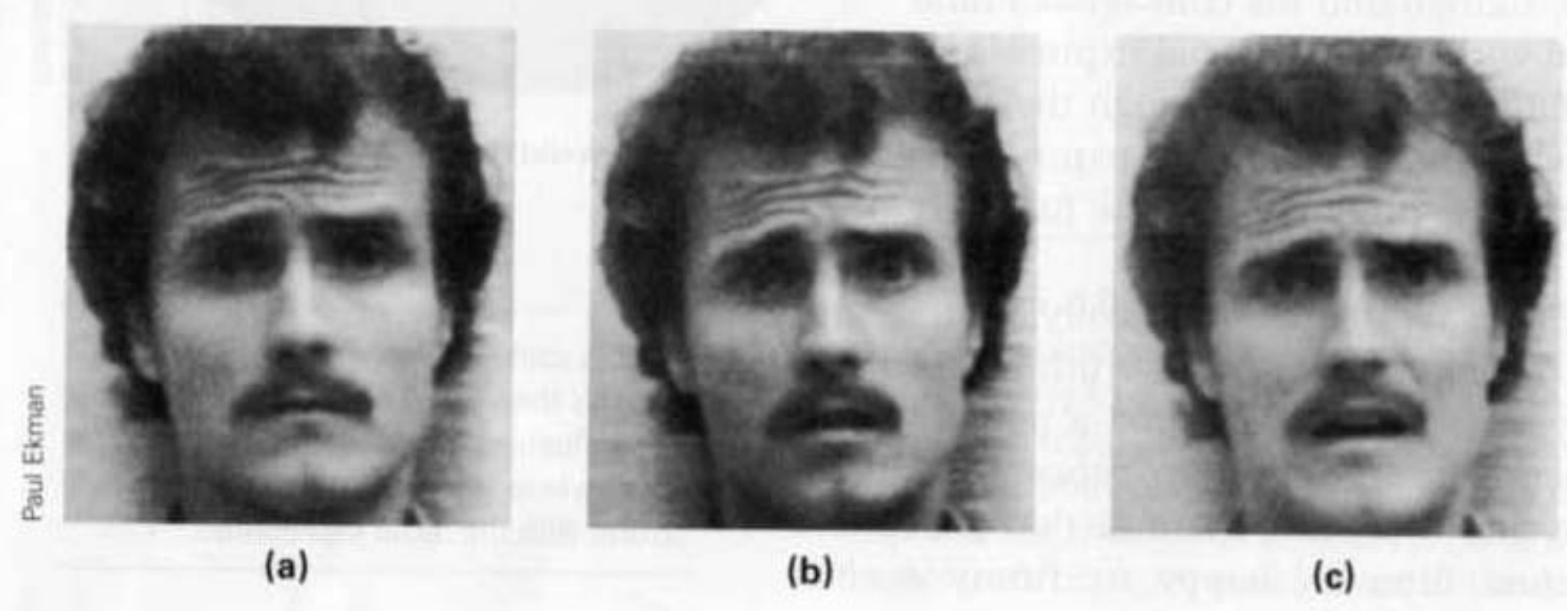


Courtesy of American Psychological Association. Used with permission. Source: Soussignan, R. "Duchenne Smile, Emotional Experience, and Autonomic Reactivity: A Test of The Facial Feedback Hypothesis." *Emotion* 2, no. 1 (2002): 52-74.

Facial Feedback Hypothesis

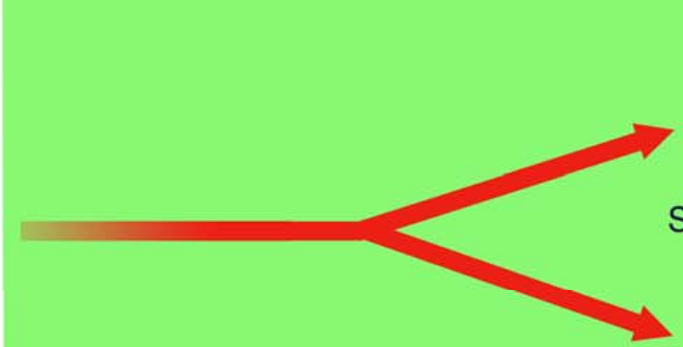
Saussignan's (2002) experiment testing the facial feedback theory of emotion asked some subjects to hold a pencil between their teeth in such a way that their lips being pulled back like they would in a full-faced smile, and others were asked to hold a pencil between their lips in a way which prevented smiling.

Alteration of facial expression can lead to changes in the subjective experience of emotions. The person on the left (pen in mouth) is more likely to report feeling happy than the person on the right (pencil on lip).



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Video stills from a study by Ekman and his colleagues (1983). They induced a man to make a fearful expression by instructions: (a) "Raise your brows and pull them together," (b) "now raise your upper eyelids," and (c) "now stretch your lips horizontally, back toward your ears."

Theory	Stimulus	Response	Report
Common sense		 Subjective experience  Body response (arousal)	"My heart is pounding because I feel afraid."
James-Lange		 Body response (arousal)  Subjective experience	"I feel afraid because my heart is pounding."
Cannon-Bard		 Subjective experience  Body response (arousal)	"The bear makes me feel afraid and my heart pounds."

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HOW CAN PERIPHERAL BODILY EVENTS INFLUENCE EMOTIONS?

- perception/thought influences TYPE of emotion
- sensory feedback influences INTENSITY of emotion

HOW CAN PERIPHERAL BODILY EVENTS INFLUENCE EMOTIONS?

- Schacter, 1971 injected people with adrenaline (raises heart rate, arousal) or placebo
- little effect of adrenaline (jumpy)
- emotion eliciting situation - more fear for a horror movie, more anger when insulted, more laughter for comedy with adrenaline (but not if informed about the adrenaline)

Creaky Bridge Experiment

- Dutton & Aron
- Capilano Canyon, North Vancouver
 - flimsy suspension bridge, 5 ft wide, sways & wobbles 320 ft over jagged boulders and river rapids
 - upstream, steady, low, broad bridge

Creaky Bridge Experiment

- Dutton & Aron - male subjects
- in the middle of each bridge is an attractive female (confederate) asks each male subject to fill out a questionnaire, casually mentions that if subjects has more questions, he can call her at home and provides phone number
- dangerous bridge more calls
- safe bridge fewer calls

Creaky Bridge Experiment

- Dutton & Aron - male subjects
- dangerous bridge produces high arousal (increased adrenaline) interpreted as attraction (physiology interpreted as emotion of attraction)

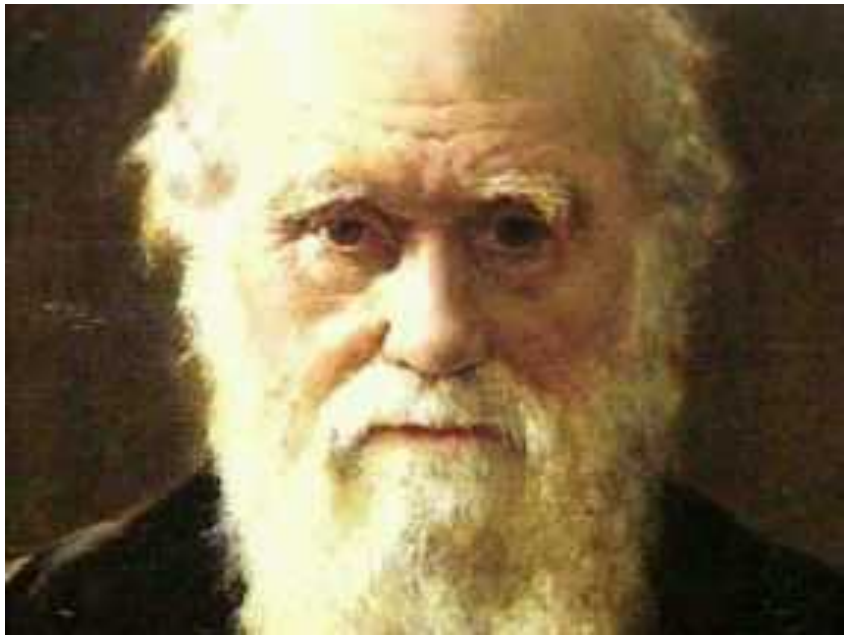
Theory	Stimulus	Response	Report
Common sense		FEAR → Subjective experience →  Body response (arousal)	"My heart is pounding because I feel afraid."
James-Lange		 Body response (arousal) → FEAR Subjective experience	"I feel afraid because my heart is pounding."
Cannon-Bard		FEAR Subjective experience  Body response (arousal)	"The bear makes me feel afraid and my heart pounds."
Two-factor		 Body response (arousal) →  Interpretation → FEAR Subjective experience	"My pounding heart means I'm afraid because I interpret the situation as dangerous."

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Three Burning Questions

- Are emotions universal (inborn)?
- Do emotions have unique physiological signatures?
- Why do we have emotions?

Are Emotions Universal?



Charles Darwin (1809-1882)

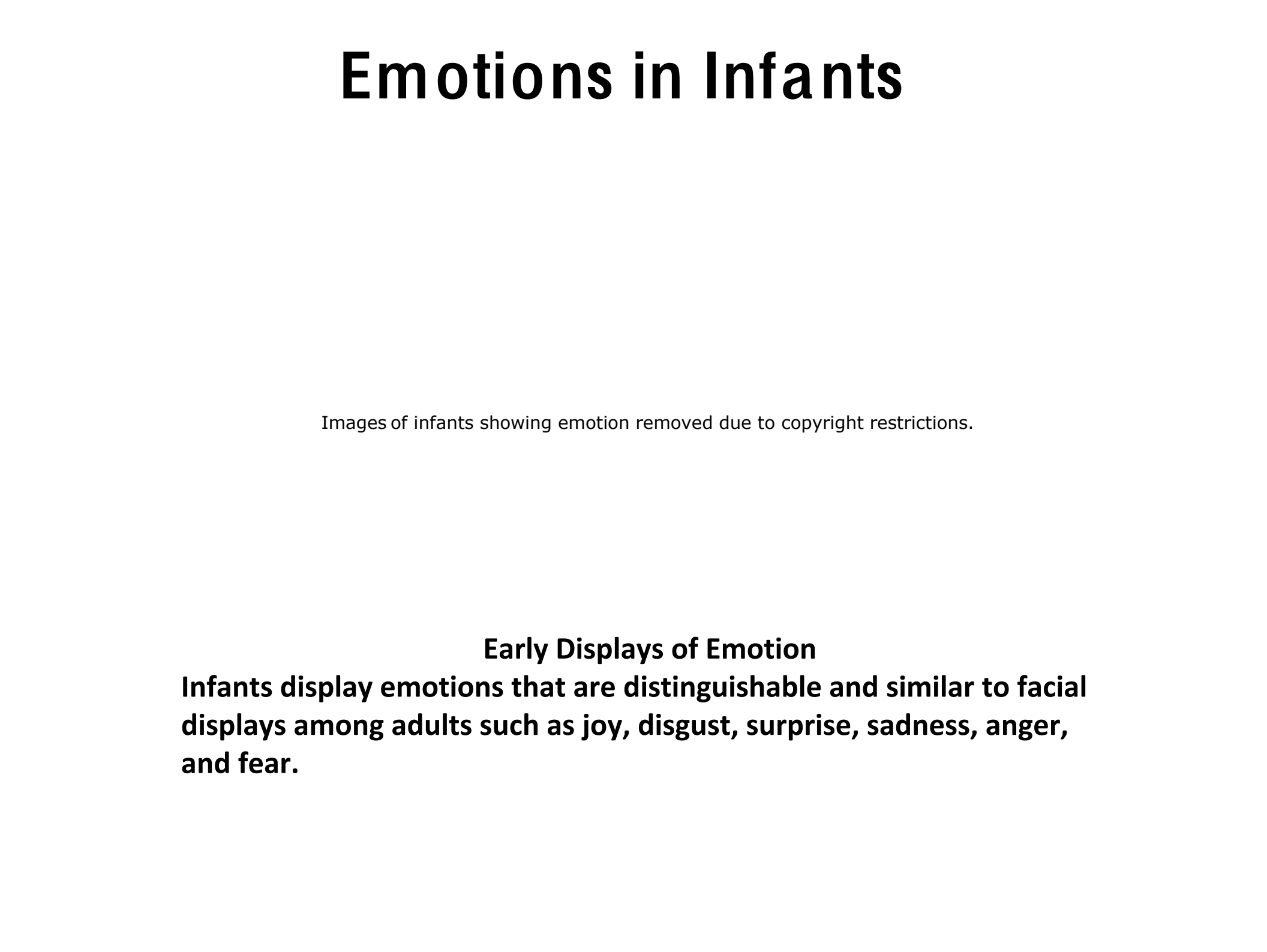
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Emotions in Animals



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Emotions in Infants



Early Displays of Emotion

Infants display emotions that are distinguishable and similar to facial displays among adults such as joy, disgust, surprise, sadness, anger, and fear.

Emotions in the Deaf and Blind

Spontaneous Facial Expressions of Emotion in Athletes

- 2004 Olympics and Paralympic Games
- congenitally blind, noncongentially blind, sighted athletes
- analyzed expressions after winning and losing

(Matsumoto & Willingham, 2009)



Courtesy of the American Psychological Association. Used with permission.

Comparison of Blind and Sighted Athletes Who Just Lost a Match for a Medal



Courtesy of the American Psychological Association. Used with permission.

Emotions Across Cultures

"A smile means friendship to everyone?"

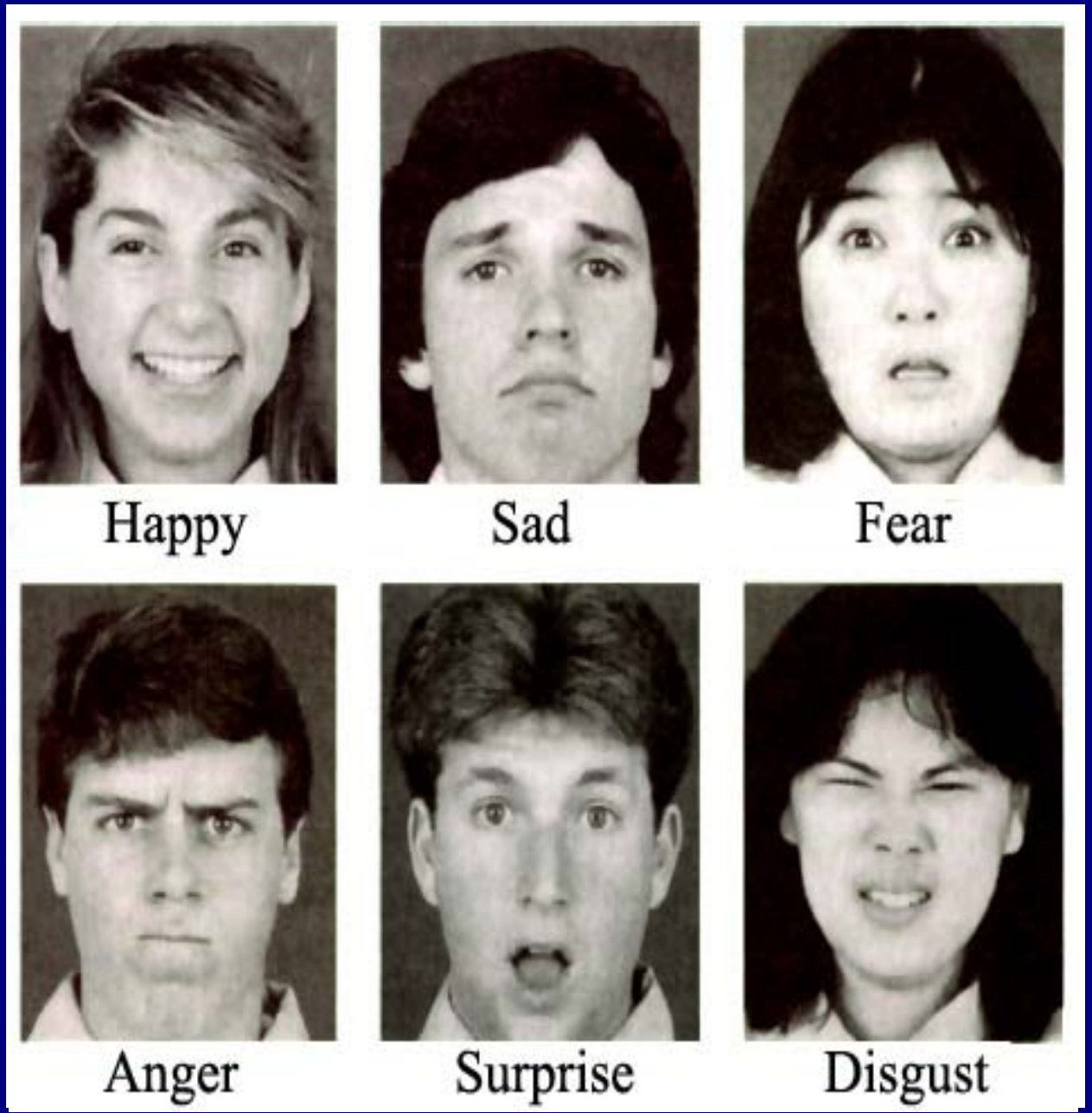
Paul Ekman

Professor of Psychology
Department of Psychiatry
UCSF Medical School

Carl Izard

Professor of Psychology
University of Delaware

Six Basic Emotions



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Recognition of Emotions

	Western	Non-Western
Anger	79%	62%
Disgust	81%	69%
Fear	77%	63%
Happy	95%	87%
Sadness	87%	75%
Surprise	87%	78%

Fore Tribe in New Guinea

Isolated Preliterate

Photos of tribe members showing various emotions removed due to copyright restrictions.

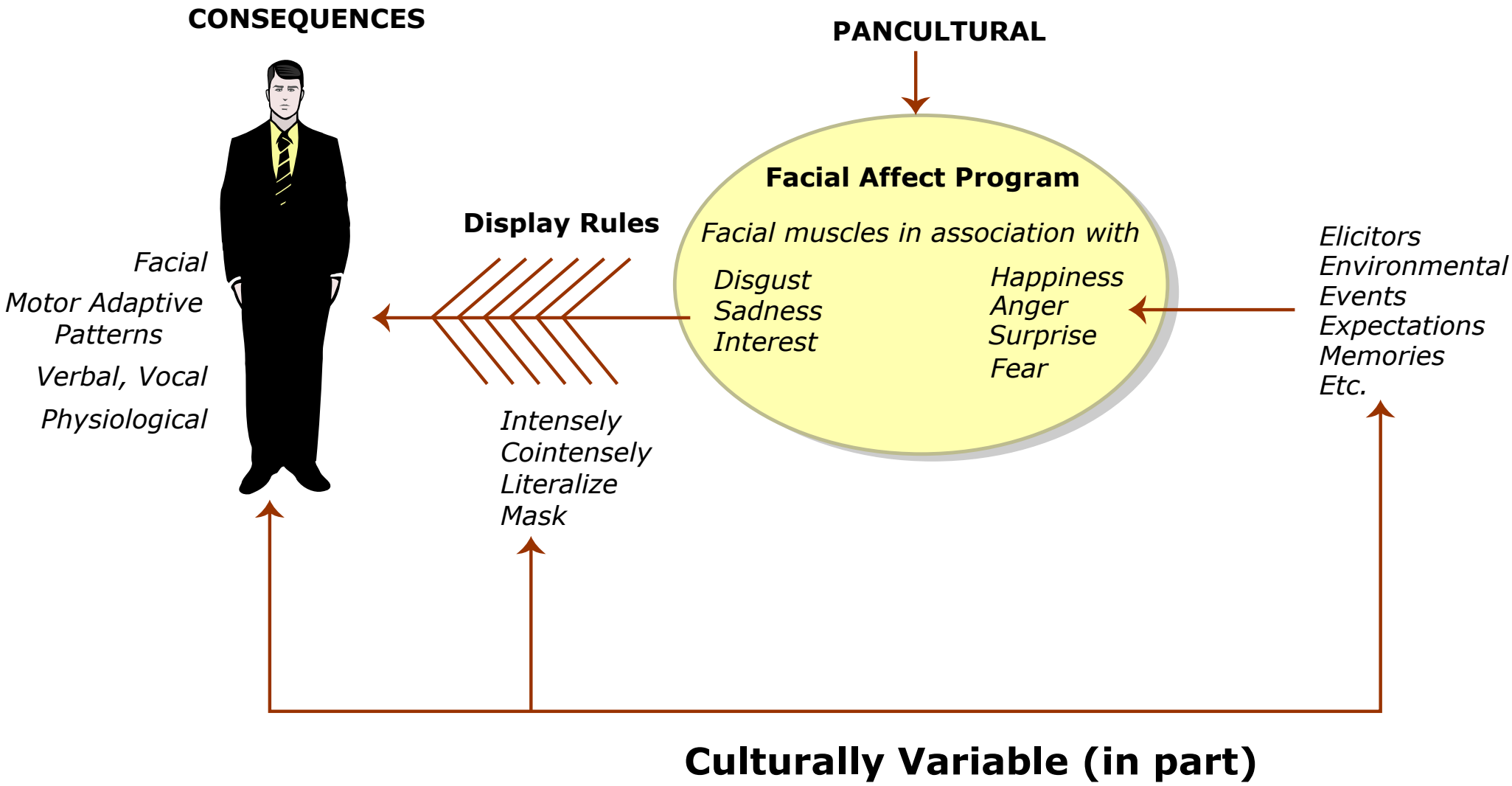
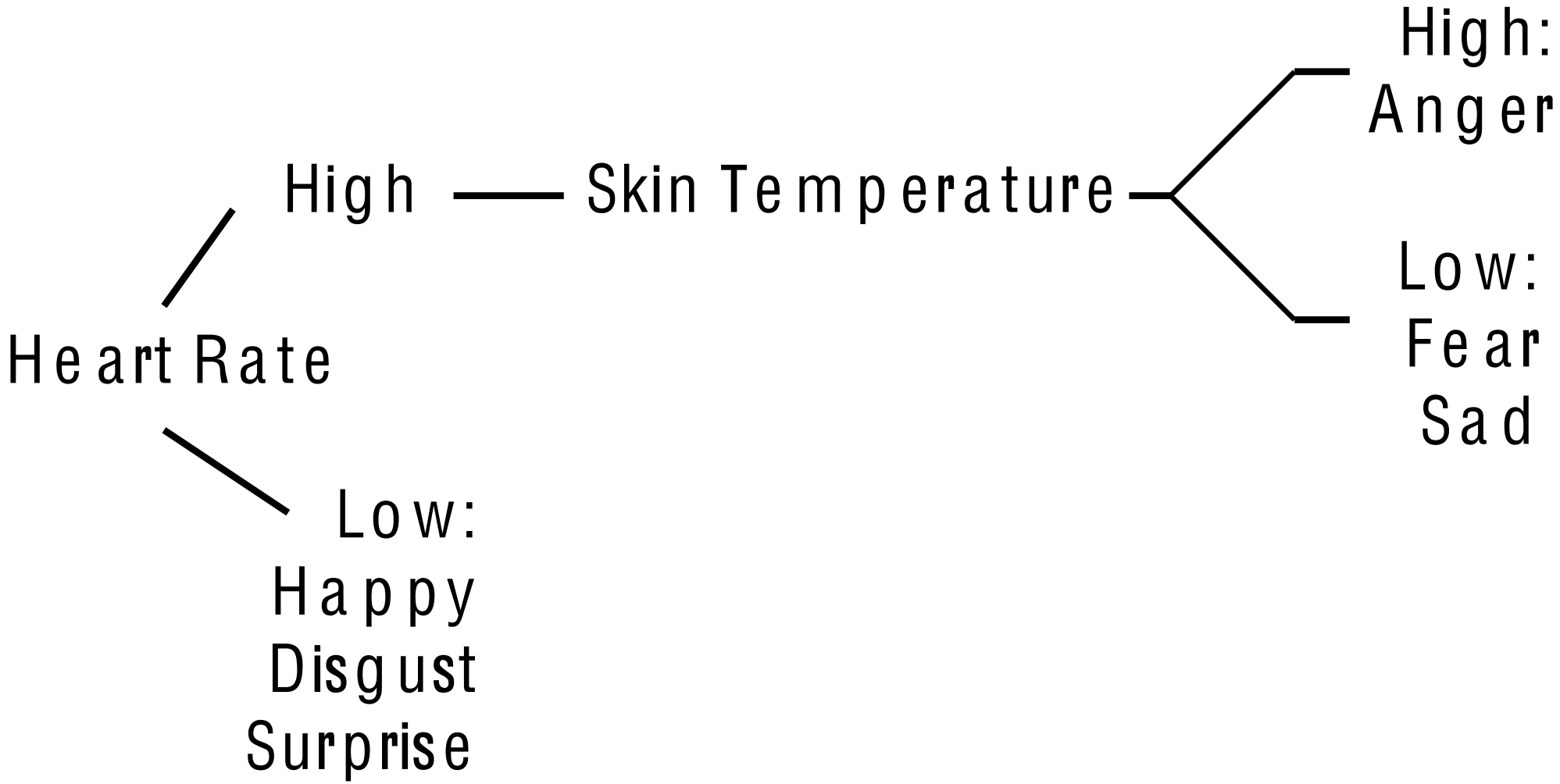


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Do Emotions Have Unique Physiological Signatures?

- Intuition holds that emotions differ from one another in their bodily manifestations (e.g., pride, disgust, anger, sadness, fear).
- Language supports this common sense idea (e.g., “She got hot and bothered,” “You make my blood boil,” He’s just letting off steam”).

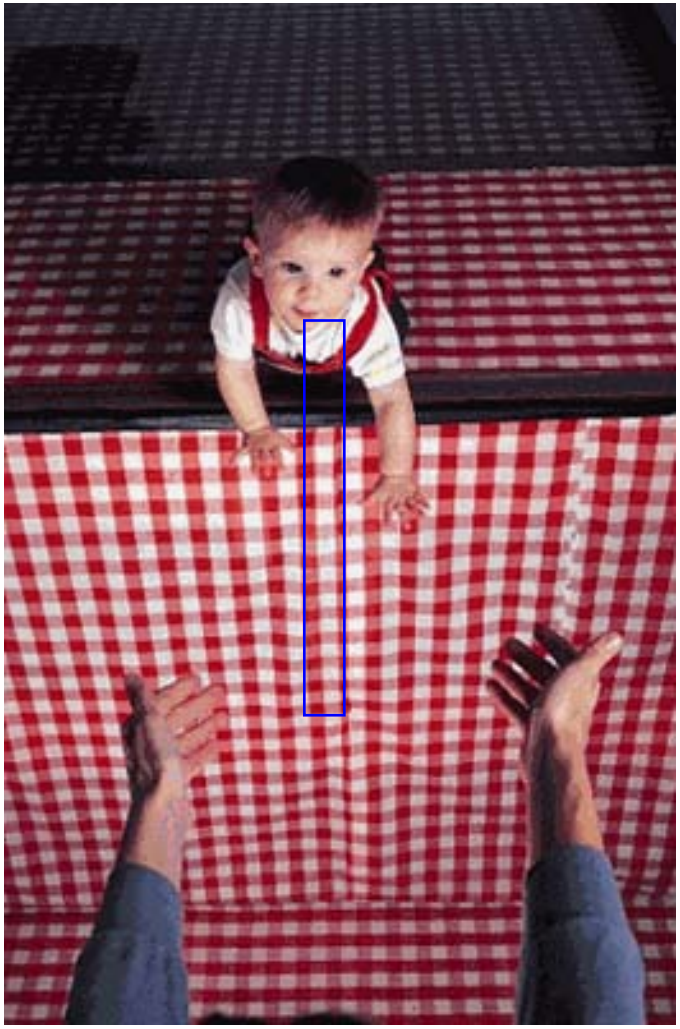


Decision tree for discriminating emotions in a facial action task (Ekman et al., 1983) - this approach has failed

Why Do We Have Emotions?

- Intrapersonal functions
 - Feeling: Affect as information
 - Behaving: Doing the right thing at the right time
- Interpersonal functions

Social Referencing



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An infant on the visual cliff: The infant is placed on the center board laid across a heavy sheet of glass and his mother calls to him. If she is on the "deep" side, he pats the glass but despite this tactual information that all is safe, he refuses to crawl across the apparent cliff.

Effect of Mothers' Facial Expressions on Infant Behavior

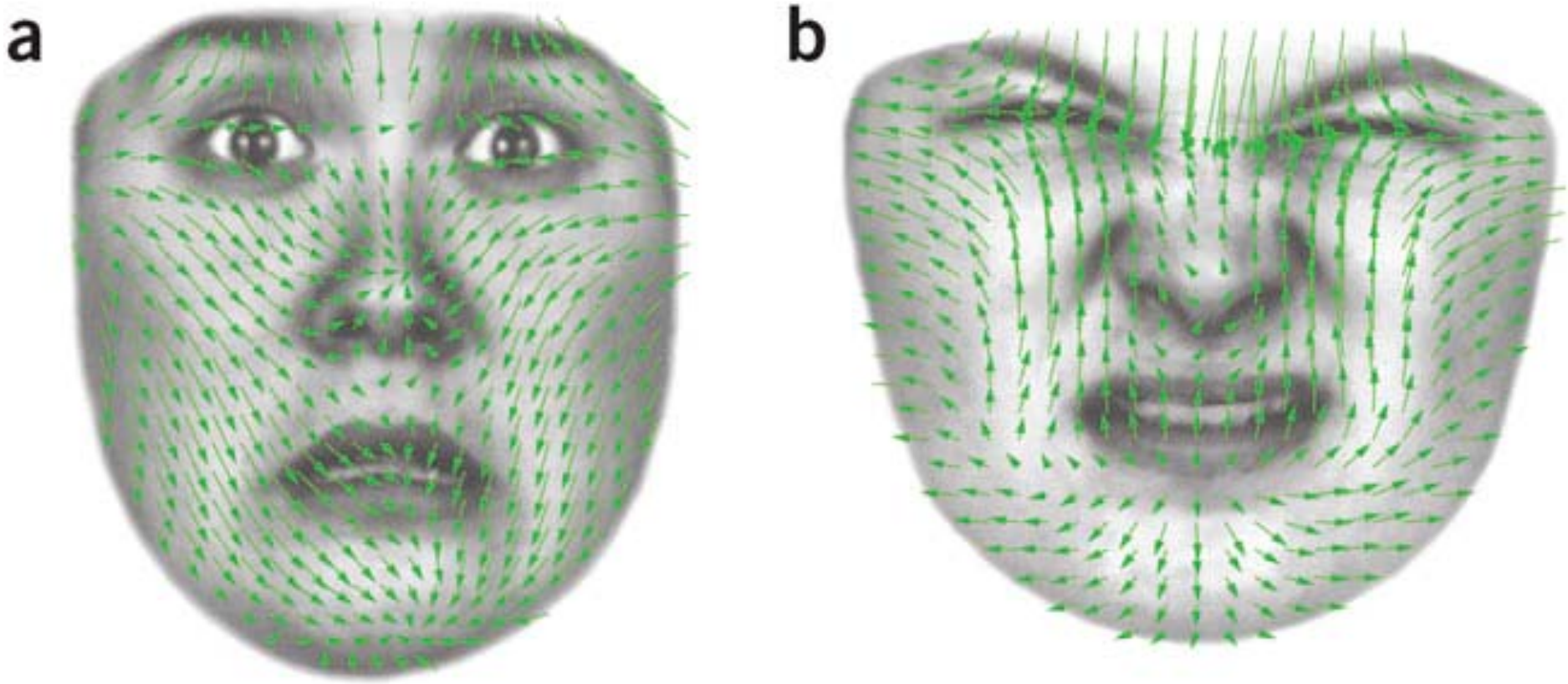
Variable	Study 1	
	Joy (N = 19)	Fear (N = 17)
Percentage of infants crossing deep side	74%	0
Mean number of retreats per minute to shallow side	.420	1.08
Mean rating of hedonic tone	1.62	2.12
Mean number of references per minute	3.60	2.46

Courtesy of American Psychological Association. Used with permission.

Why Do We Have Emotions?

- Intrapersonal functions
 - Feeling: Affect as information
 - Behaving: Doing the right thing at the right time
- Interpersonal functions
- Do expressions have functional purposes? (Adam Anderson)

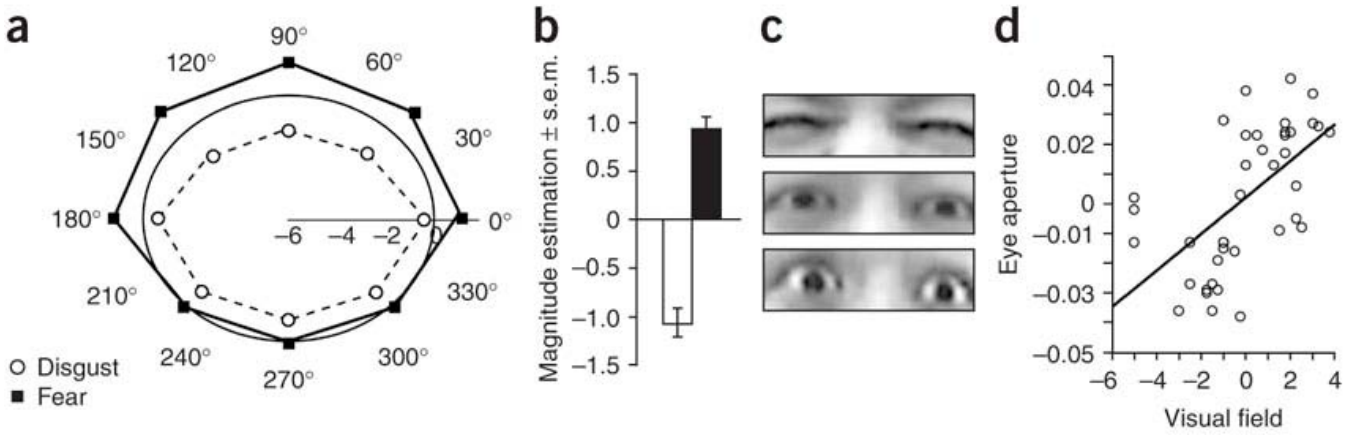
Expressing Fear Enhances Sensory Acquisition



*(**a**,**b**) Green arrows depict vector flow fields of skin surface deformations stemming from the antiprototype to the corresponding expression prototype, allowing visualization of the underlying facial-action patterns. Vector flow from antifear to fear (**a**) and antidisgust to disgust (**b**) indicated the opposing expansion versus compression along the longitudinal axis emanating from the bridge of the nose. This resulted in raised versus lowered brows, increased versus decreased eye aperture and vertical elongation versus compression of the nose associated with raised versus lowered lips.*

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Fearful Expression enhances subjective visual field size (also faster eye movements)



(**a**) Changes in visual field estimation along horizontal, vertical and oblique axes. Central ellipse is neutral baseline. Unit markings are in 9.5° of visual angle. (**b**) Change in estimated visual-field size (in standardized units) for fear and disgust expressions relative to neutral expressions, averaged across visual-field location. (**c**) Average eye opening from participants posing disgust, neutral and fear expressions (from top to bottom row). (**d**) Correlation of vertical eye-size measurements of participants posing disgust and fear expressions with upper visual-field magnitude change from neutral.

Graph removed due to copyright restrictions. Source: Susskind, J., et al. "Expressing Fear Enhances Sensory Acquisition." *Nature Neuroscience* 11, no. 7 (2008): 843-50. © 2008.

Fearful Expression enhances air velocity and nasal volume during inspiration

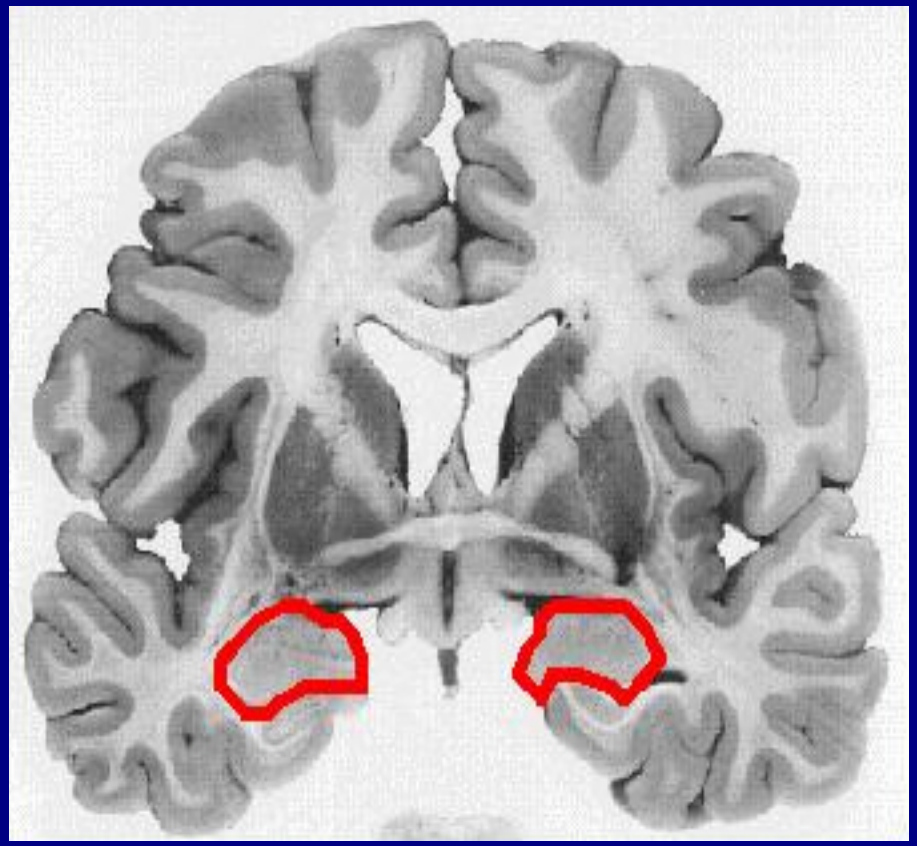
*(**a**,**b**) Mean air-flow velocity (in standardized units) for fear and disgust expressions relative to neutral during inhalation over time (2.2-s inhalation; **a**) and mean volume relative to abdominal-thoracic respiratory effort (in standardized units) for disgust and fear expressions relative to neutral (**b**). Velocity was scaled such that the area under the curve for neutral sniffs was equal to 1.*

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Fear & The Amygdala



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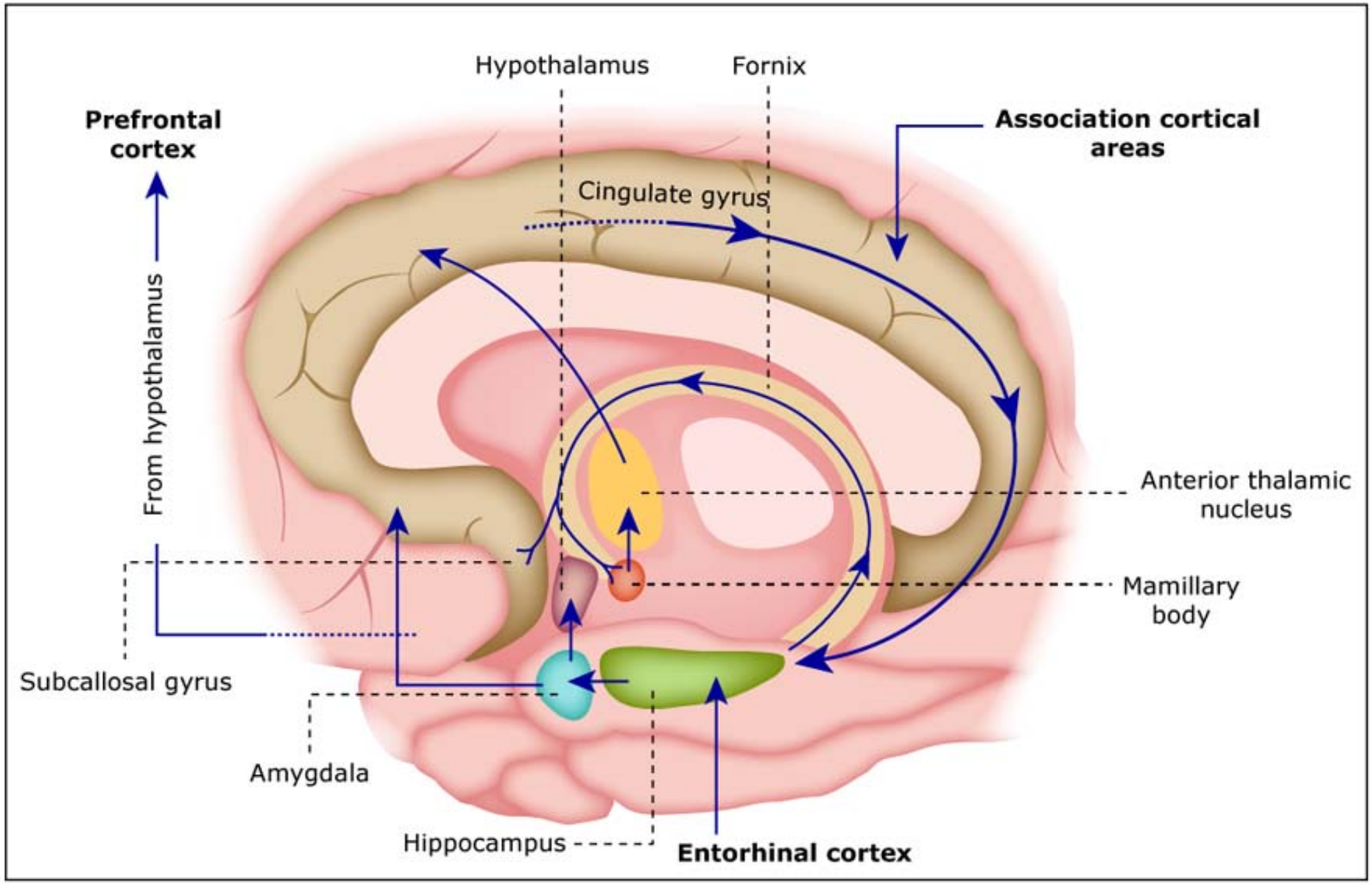
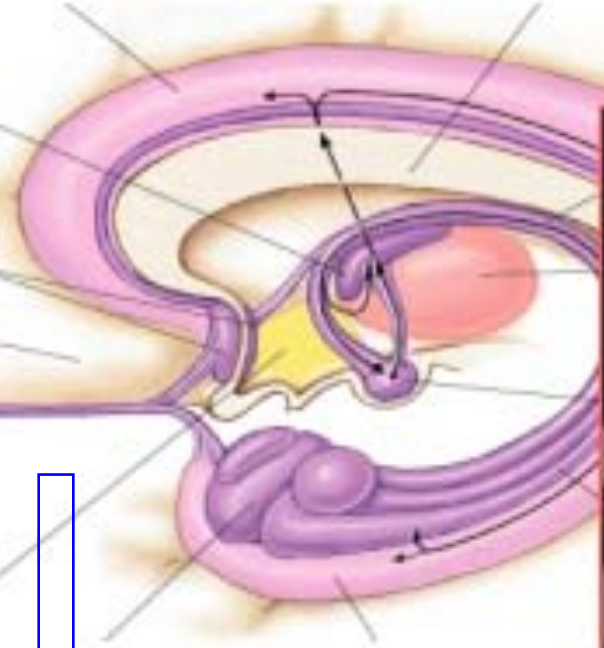
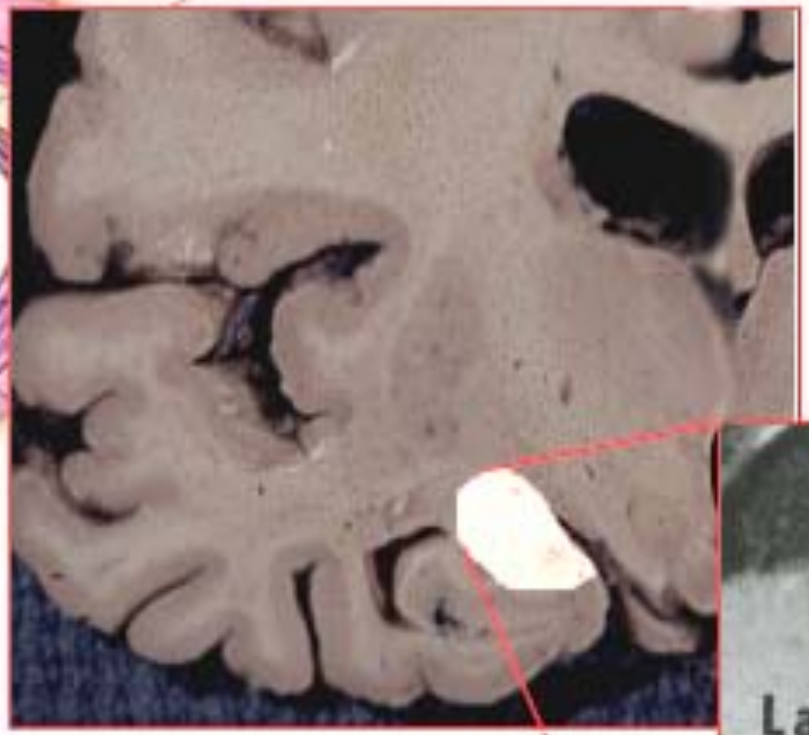
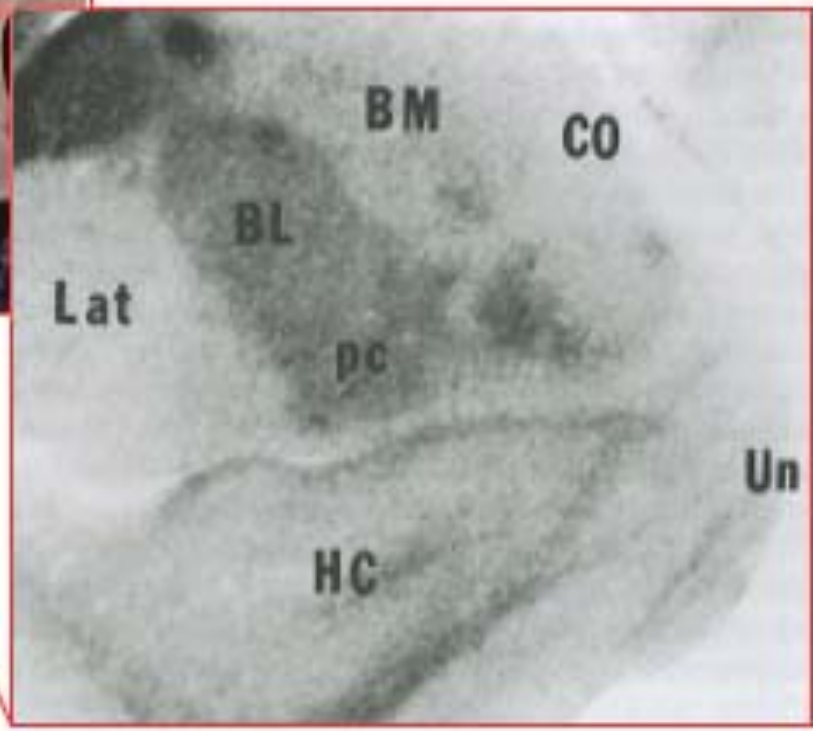


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Emotion: The amygdala







- Anterior temp lobe/ ant. to hippocampus
- Multiple nuclei
- Widespread connections: Cortex to brainstem

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Selective Amygdala Lesions



Cute and cuddly or fearsome predator?

Courtesy of American Psychological Association. Used with permission. Source: Blanchard, D., and R. J. Blanchard. "Innate and Conditioned Reactions to Threat in Rats with Amygdaloid Lesions." *Journal of Comparative and Physiological Psychology* 81, no. 2 (1972): 281-90.

Amygdala and Social Fitness

Loss of threat appreciation impairs social fitness

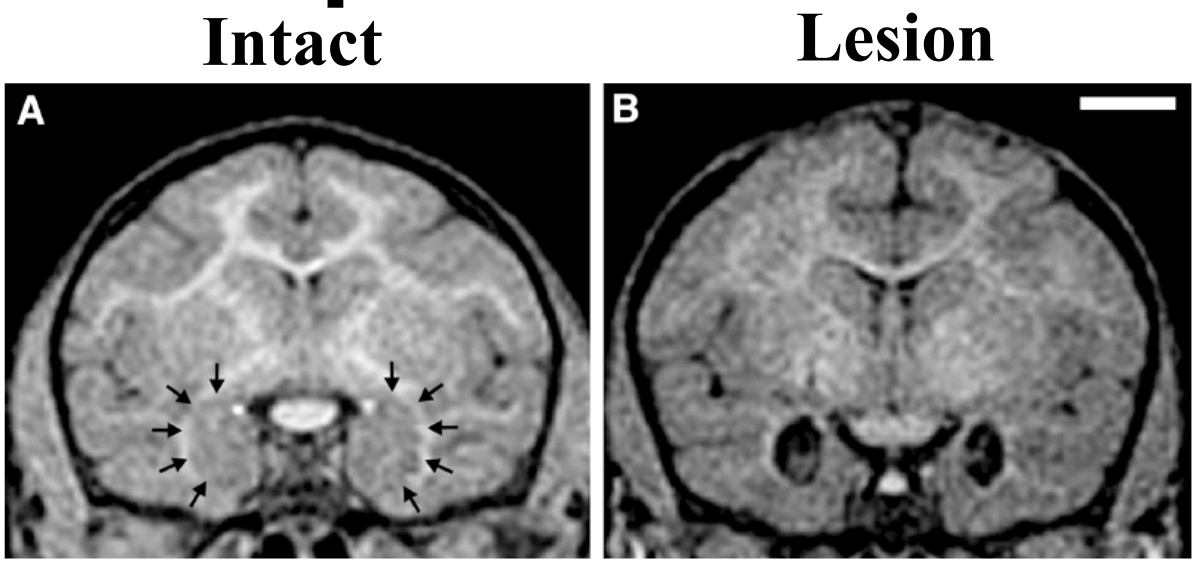
- Dominance hierarchies
- In the lab Rosvold et al. (1954)
 - Established hierarchy
 - Lesion dominant male
 - Fall to subordinate status
- In the wild Kling et al. (1970)
 - Lesion and returned to wild
 - Social rejection
 - Early death w/out social support

Selective amygdala lesions: Nonhuman primates

- Rhesus monkeys
- Lesioned @ 2 wks
- Returned to mothers
- Tested @ 6-8 months

A) Loss of neophobia

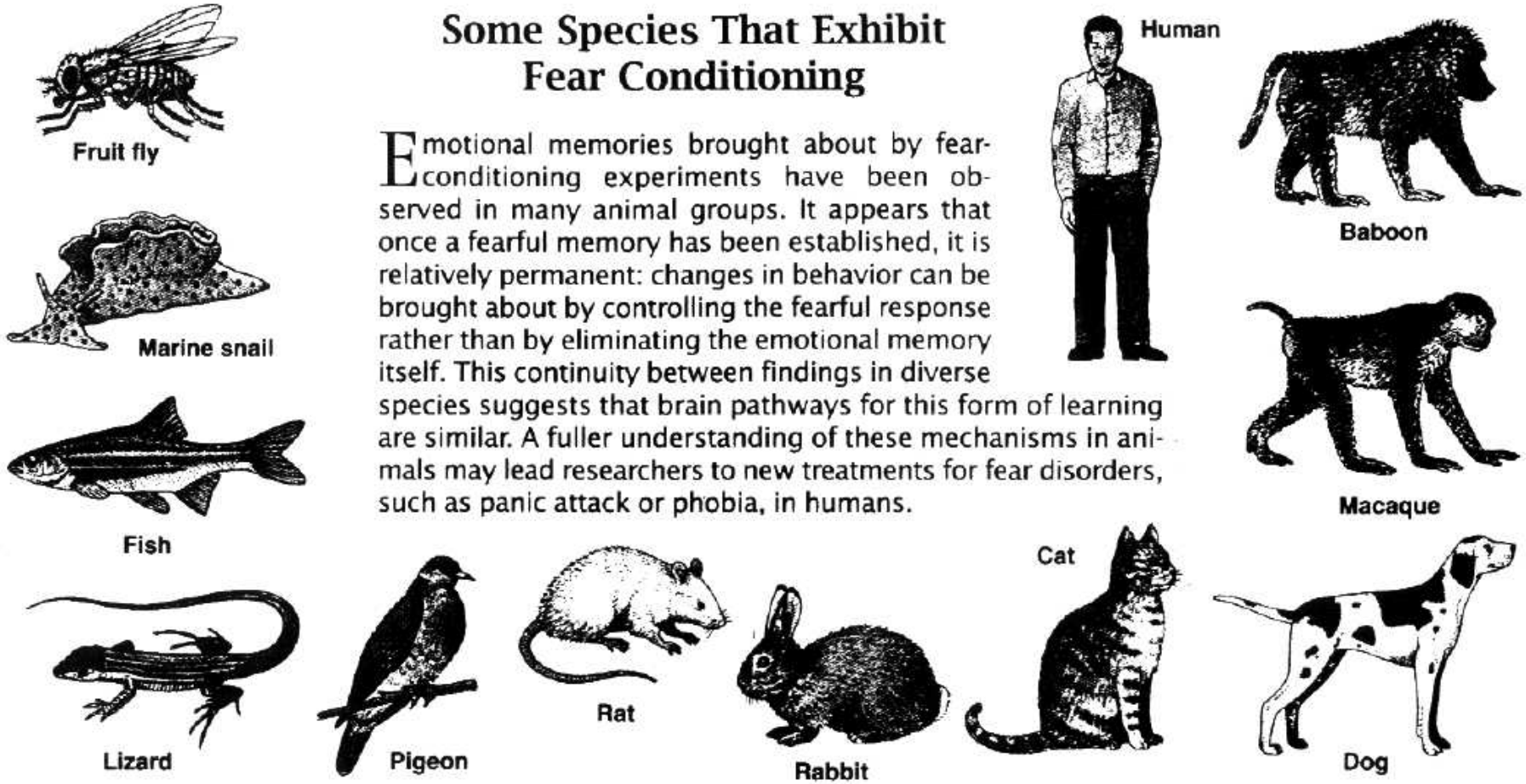
B) Loss of snake fear





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Source: Prather, M. D., et al. "Increased Social Fear and Decreased Fear of Objects in Monkeys with Neonatal Amygdala Lesions." *Neuroscience* 106, no. 4 (2001): 653-8.

Acquired Fear: Fear Conditioning



Source: LeDoux, J. "Emotion, Memory and the Brain." *Scientific American* 270, no. 6 (1994): 50-57. © 1994 Scientific American, Inc. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Fear Conditioning



CS: conditioned stimulus

US: unconditioned stimulus

CR: conditioned response

UR: unconditioned response

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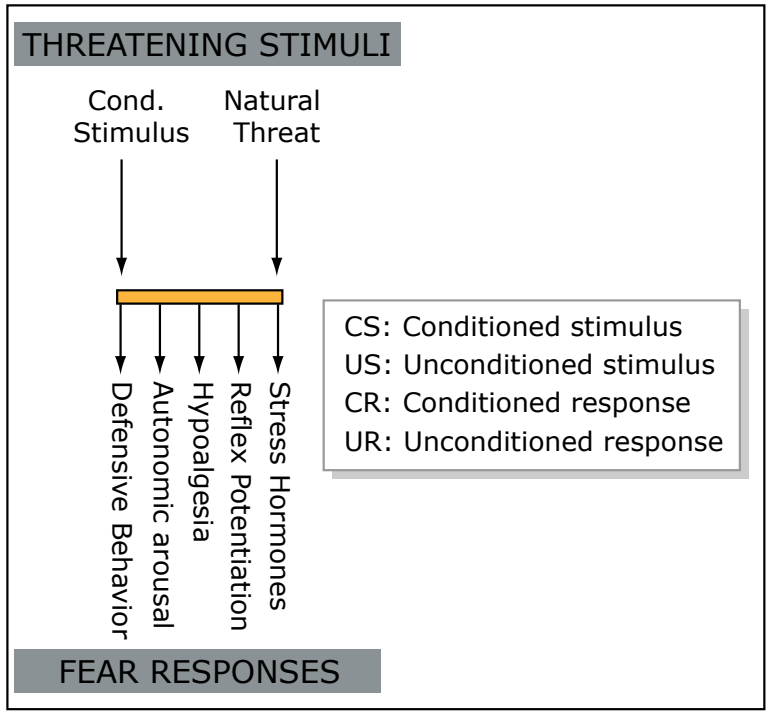
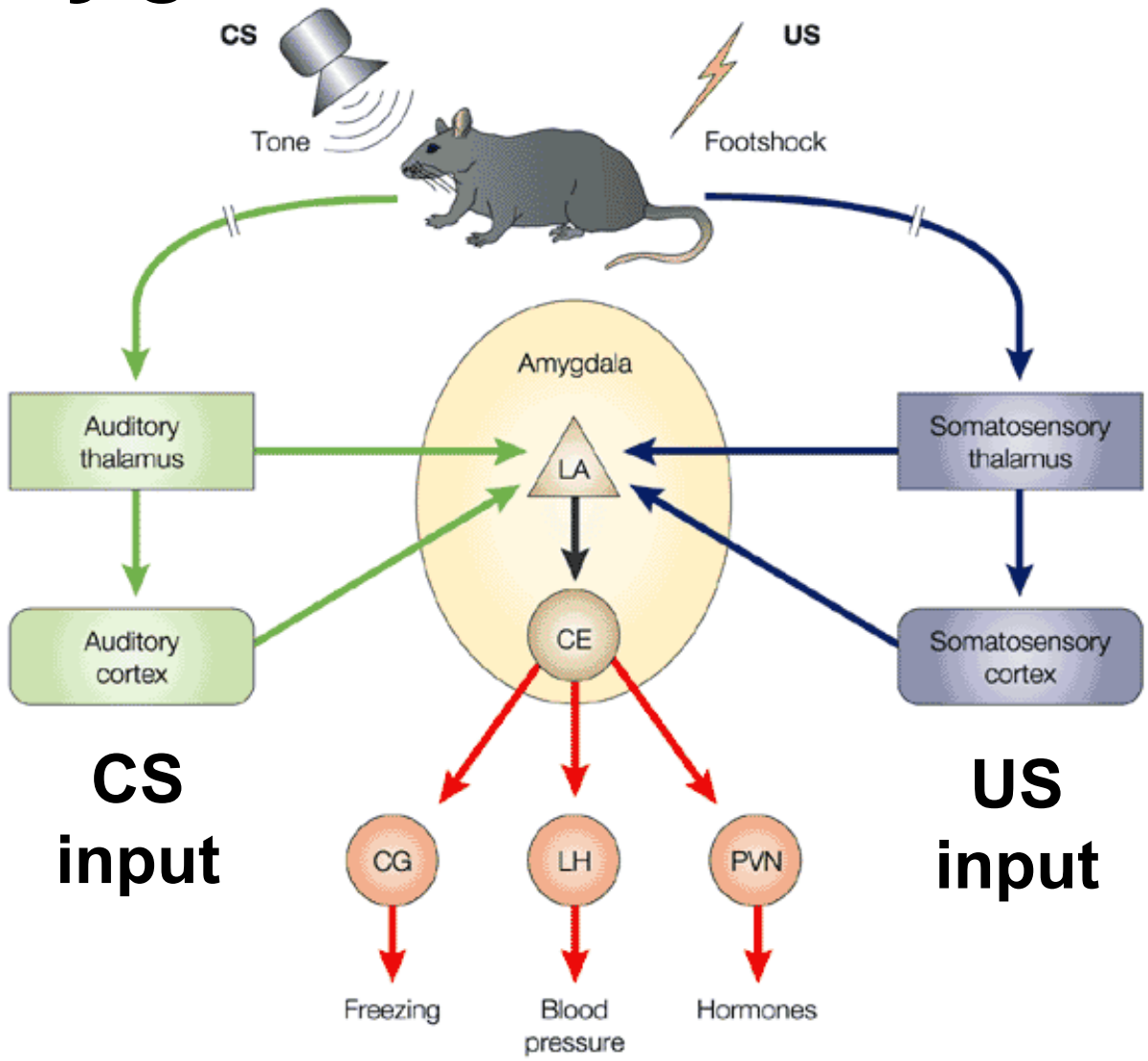


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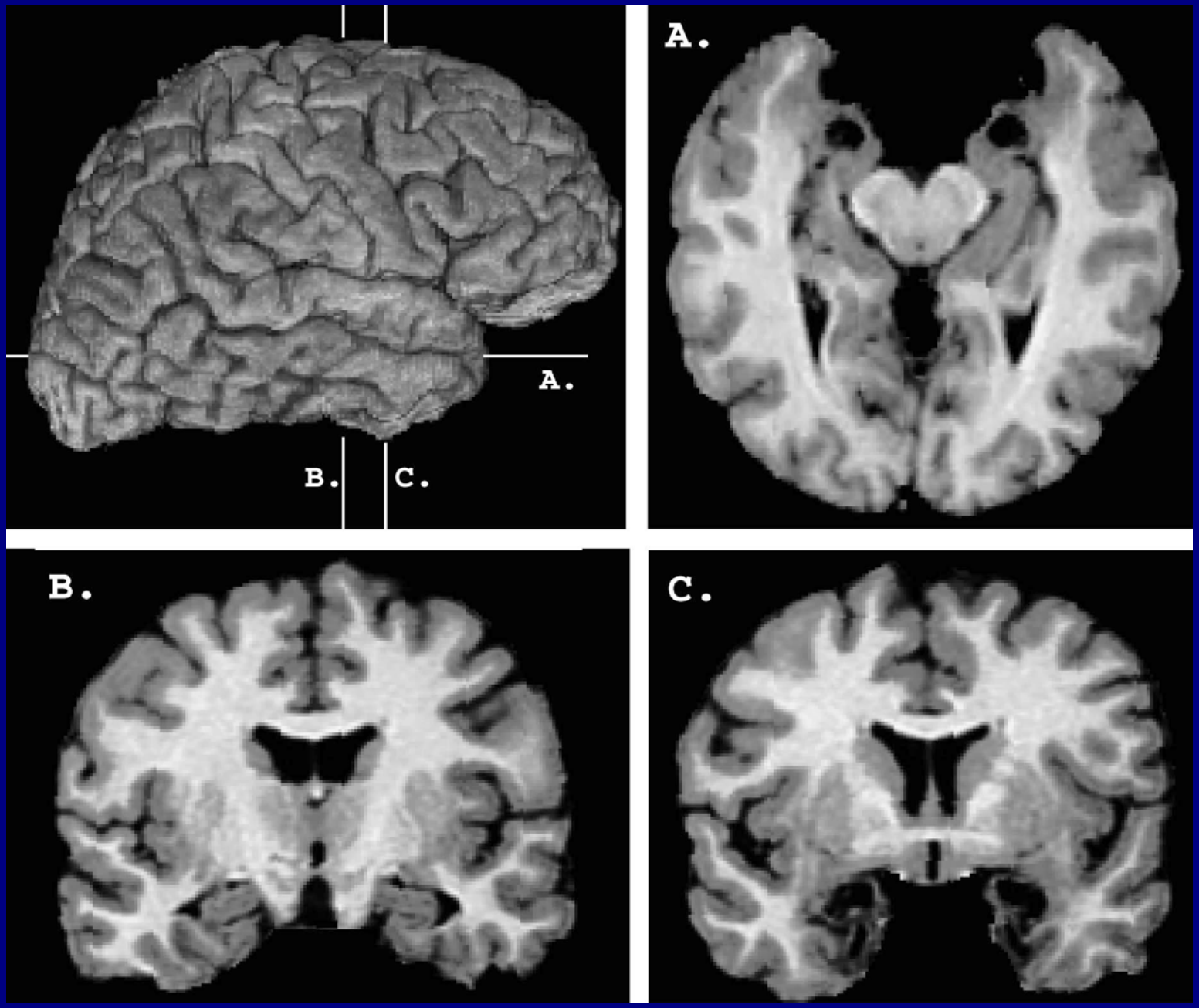
Fear conditioning depends on amygdala

- CS & US convergence
- Lesion amygdala
 - Intact UR
 - Impair CR
- Lesion cortex
 - Intact UR & CR



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Source: Medina, J., et al. "Parallels Between Cerebellum- and Amygdala-Dependant Conditioning." *Nature Reviews Neuroscience* 3, no. 2 (2002): 122-31. © 2002.

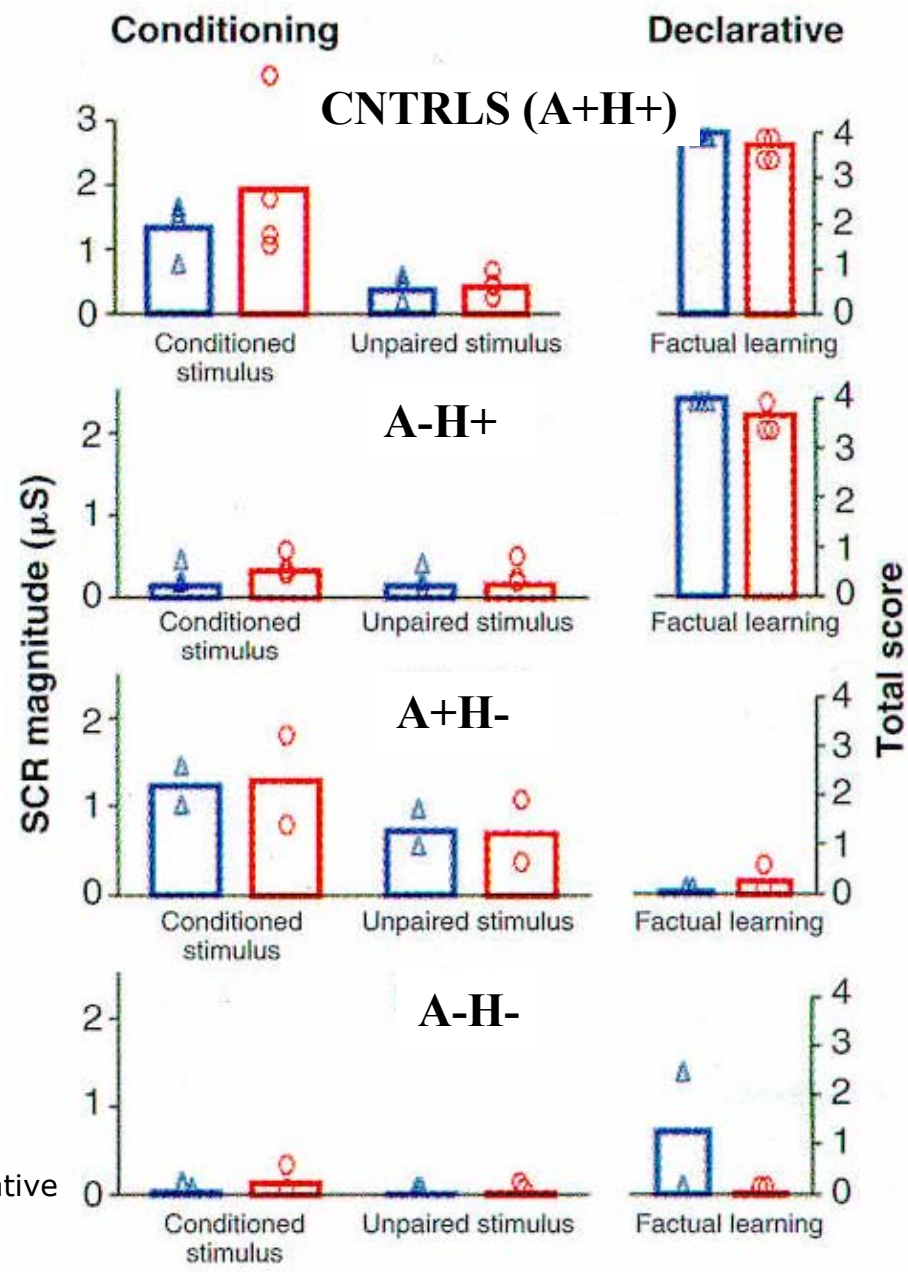
Patient S.M. - Adolphs, Damasio, Tranel et al.



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Fear Conditioning: Distinct roles of amygdala and hippocampus

- Amygdala lesion
 - Impaired autonomic
 - Intact factual
- Hippocampal
 - Intact autonomic
 - Impaired factual



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Instructed Fear

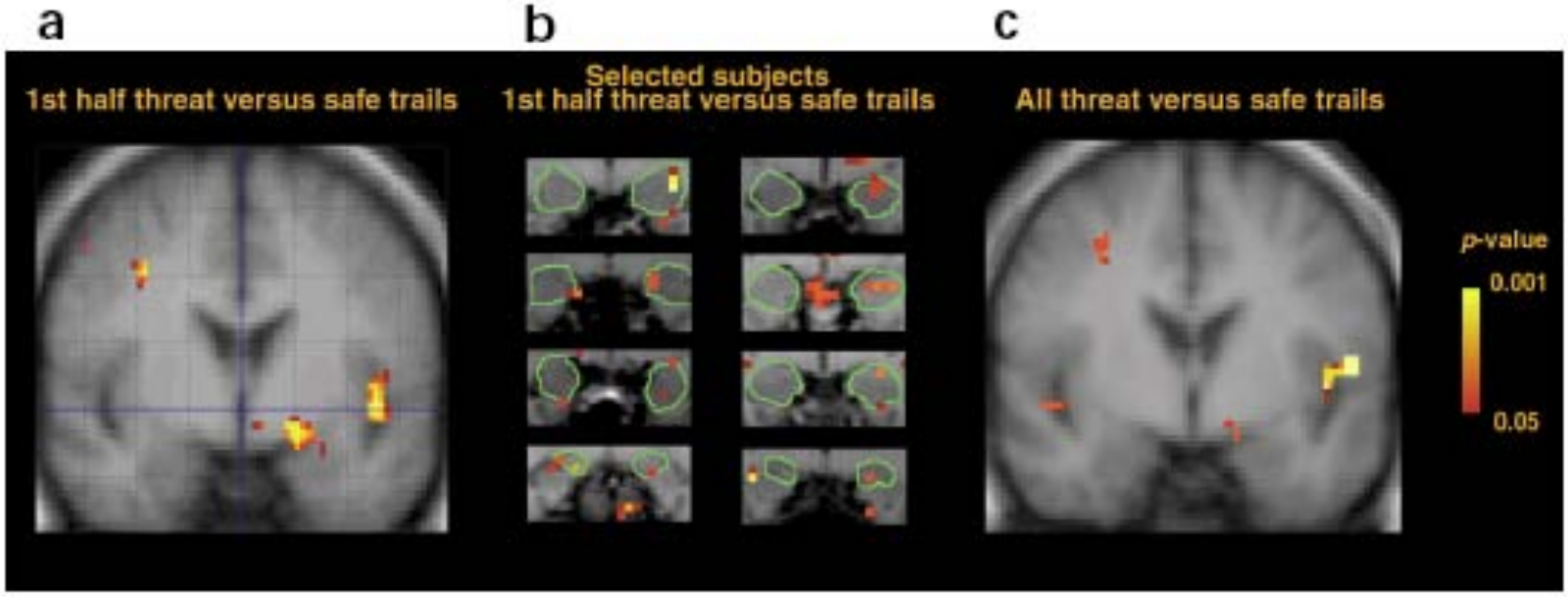
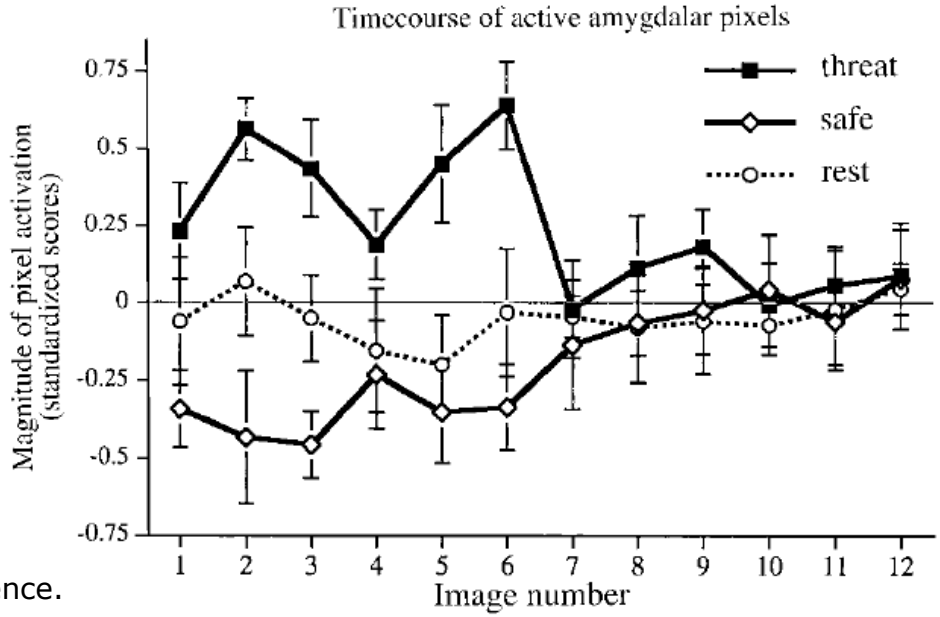


Figure 1. Threat versus safe activation.

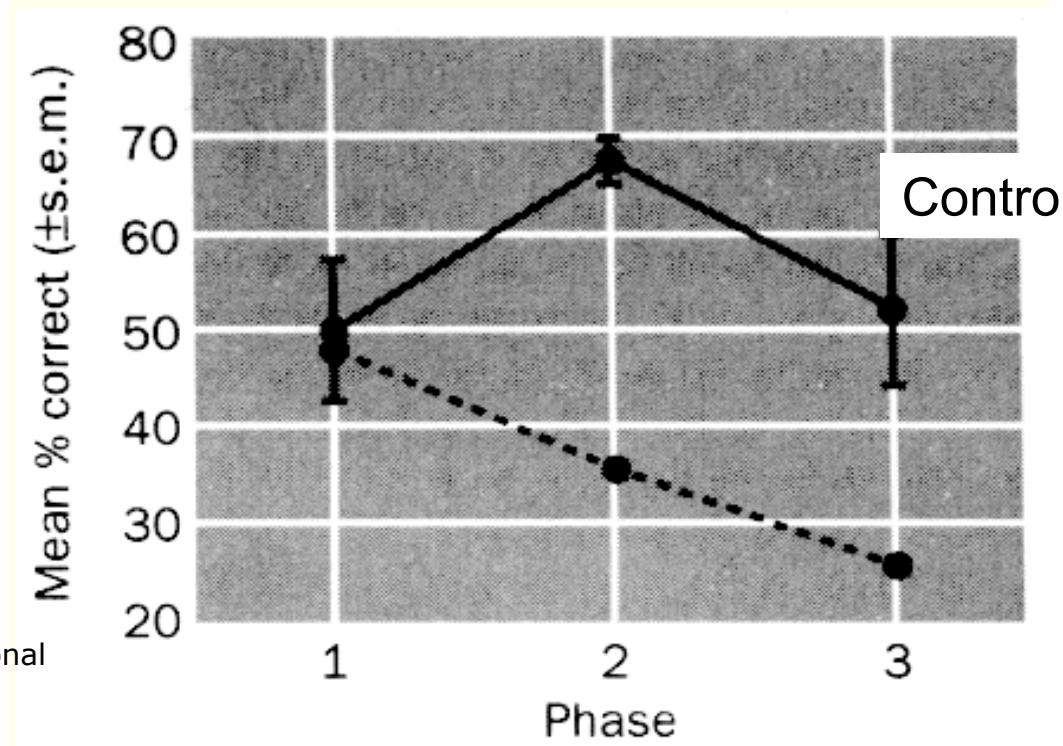
Blue Square = SAFE
Yellow Square = THREAT
REST



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Figure 2. Time course of amygdala activation

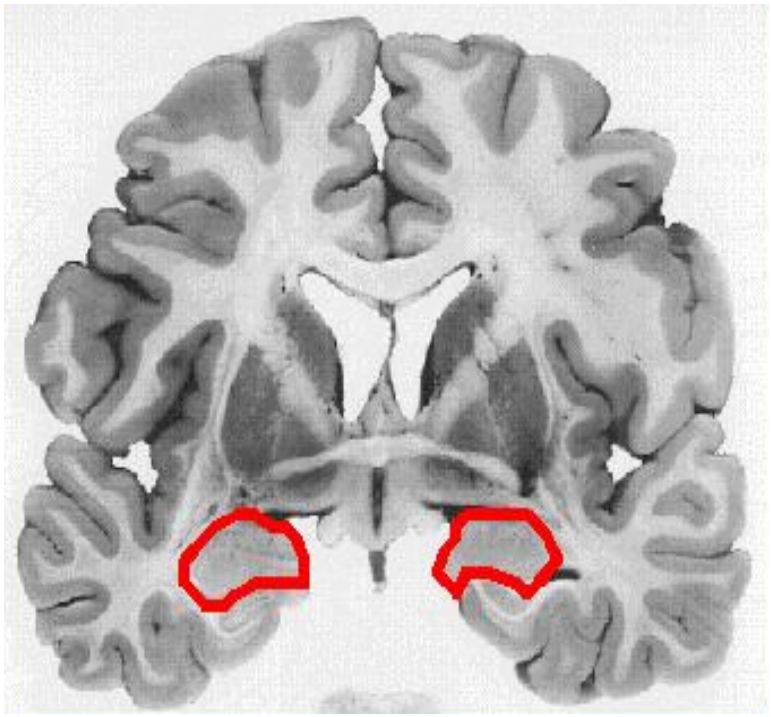
Human Amygdala: Emotional Influences on Recollection



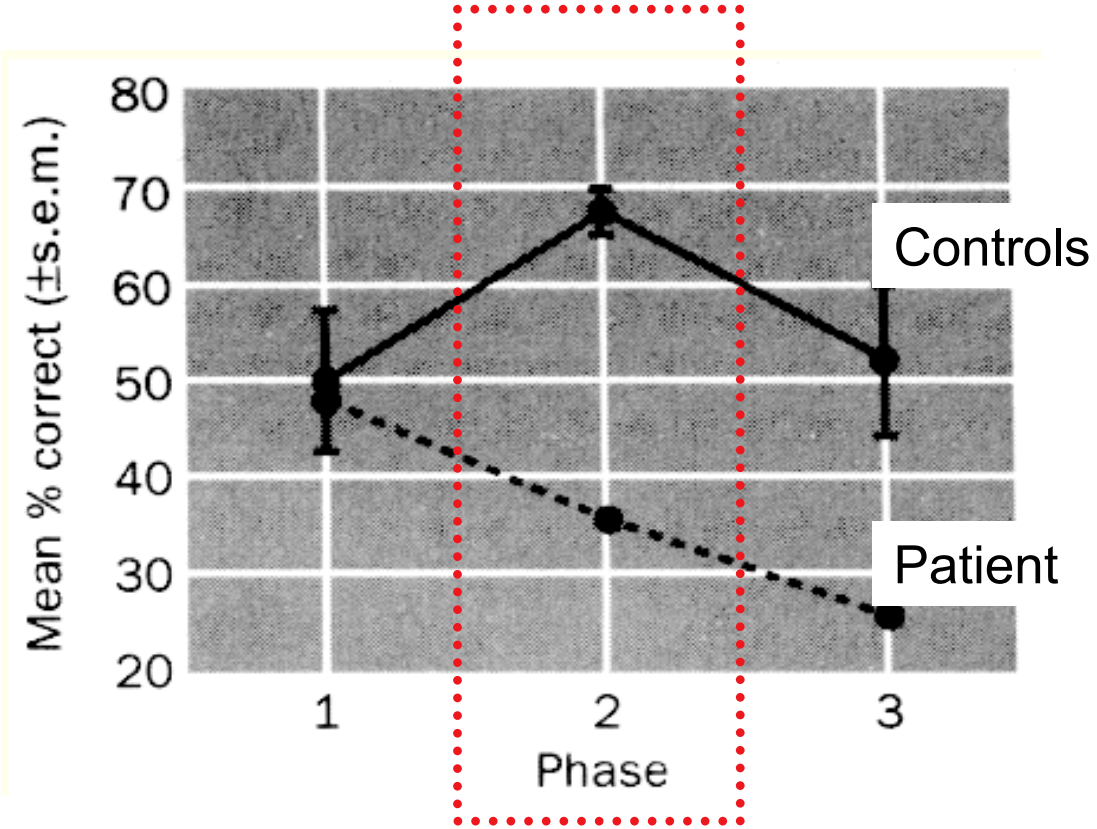
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- **View story with emotional middle section**
- **Test recall 1-week later**

Human Amygdala: Emotional Influences on Recollection



(Urbach-Wiethe Disease)



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- **View story with emotional middle section**
- **Test recall 1-week later**
- **Intact emotional reactions**
- **No enhanced memory**

Six Basic Emotions



Happy



Sad



Fear



Anger



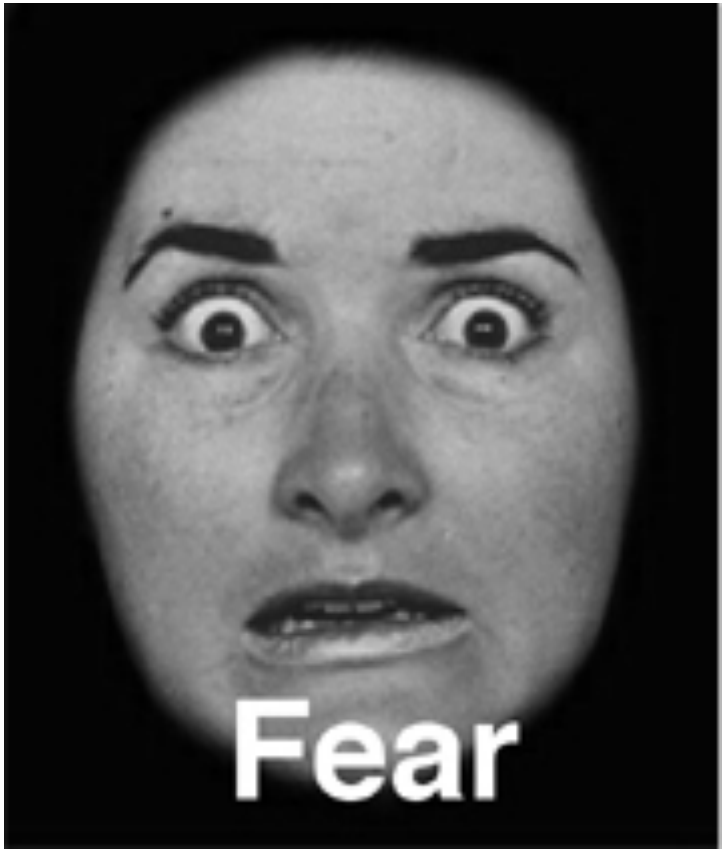
Surprise



Disgust

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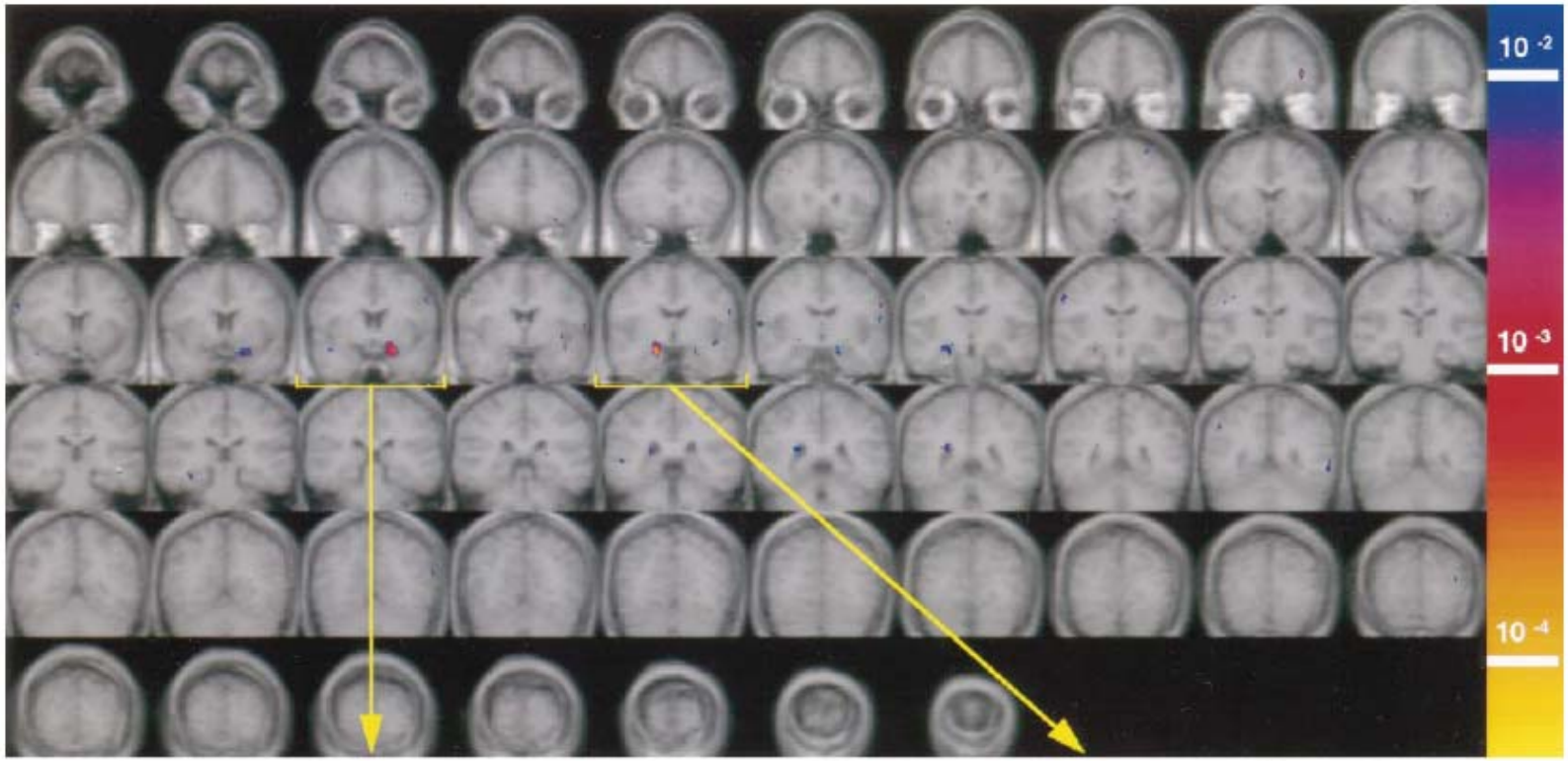
Human amygdala: Impaired recognition of fear



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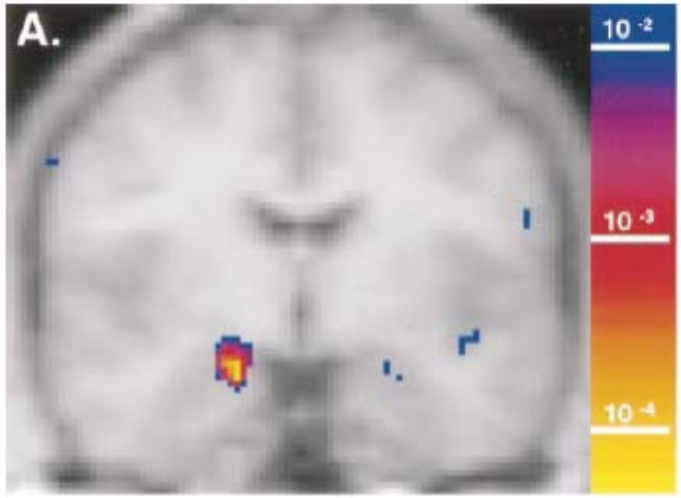
- Intact face recognition
- Impairment selective for fear

Subliminal Fear Faces > Subliminal Happy Faces

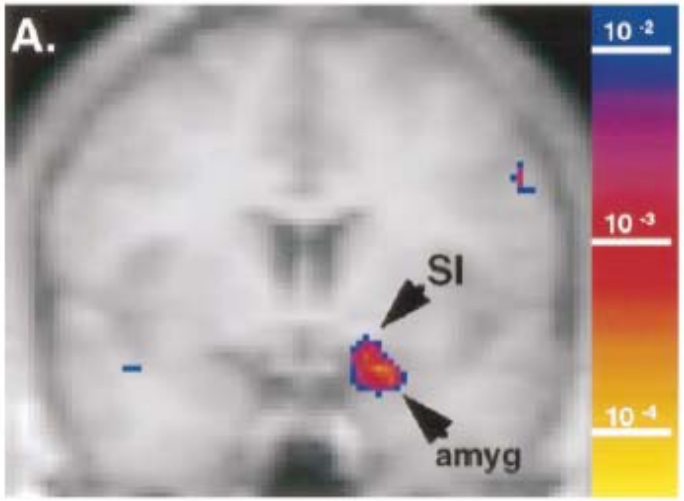


Left Amygdala/SI (y = 0; see Figure 3)

Right Amygdala (y = -6; see Figure 2)



y = -6

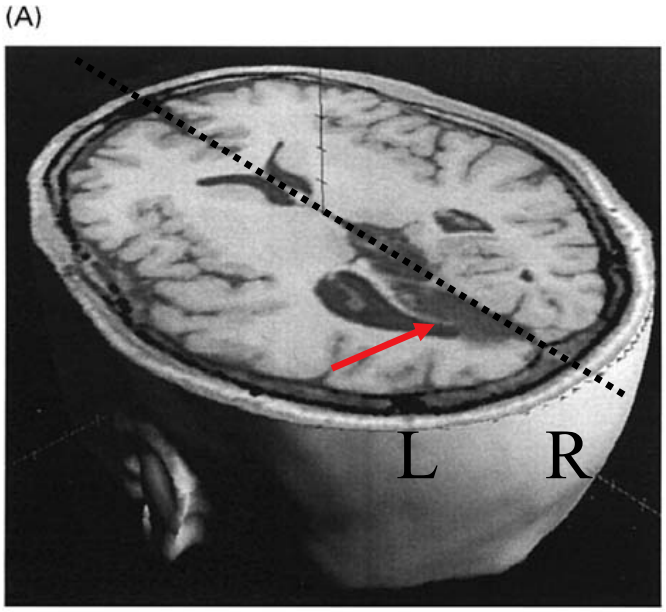


y = 0

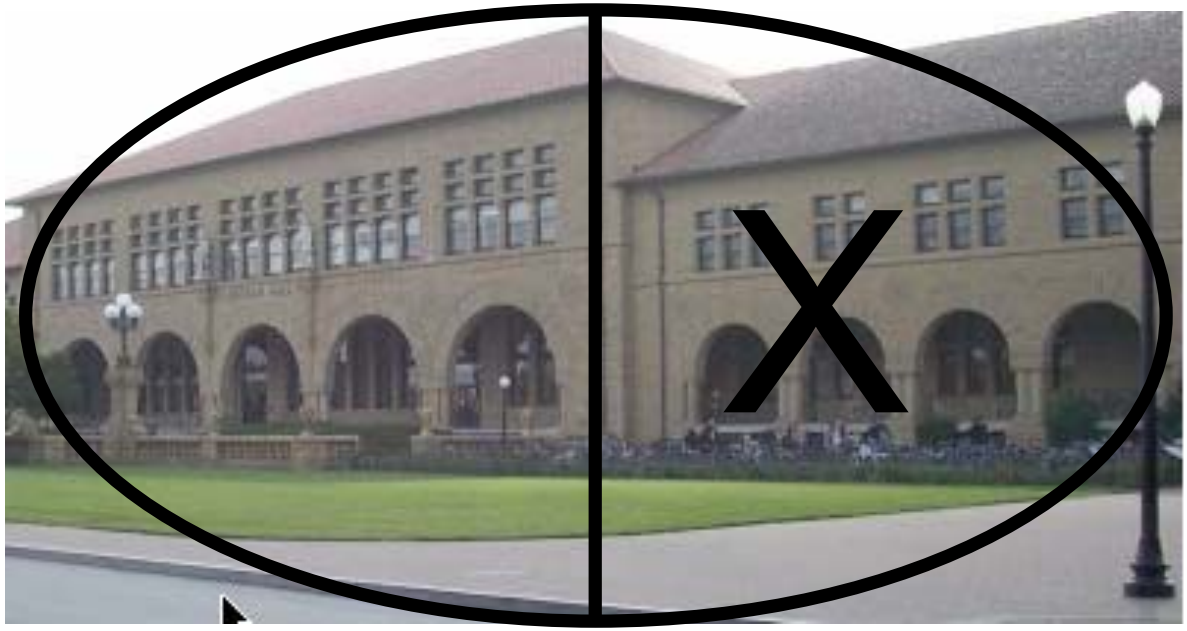
Whalen, 1998

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Cortical blindness: Fear blindsight



- **Does amygdala response depend on cortex?**
- **Examine patient w/ cortical blindness**
- **Examine amygdala response in the absence of cortex/awareness**

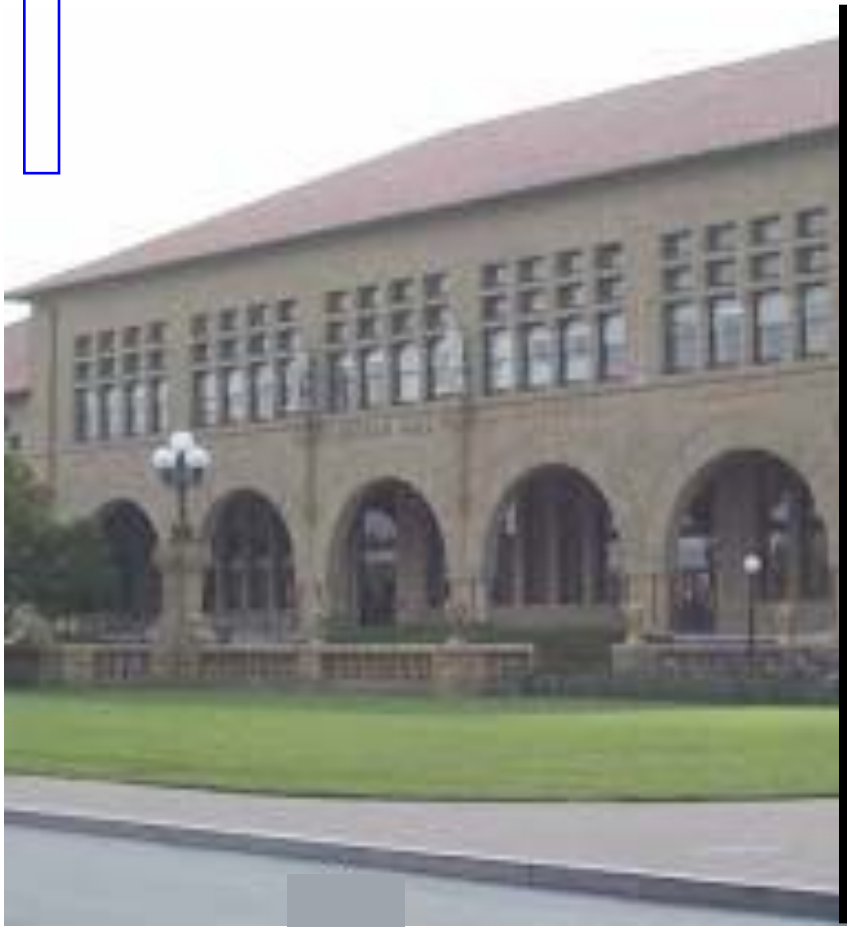


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Morris et al., 2001

Cortical blindness: Fear blindsight

Intact/Seen



Lesion/Blind

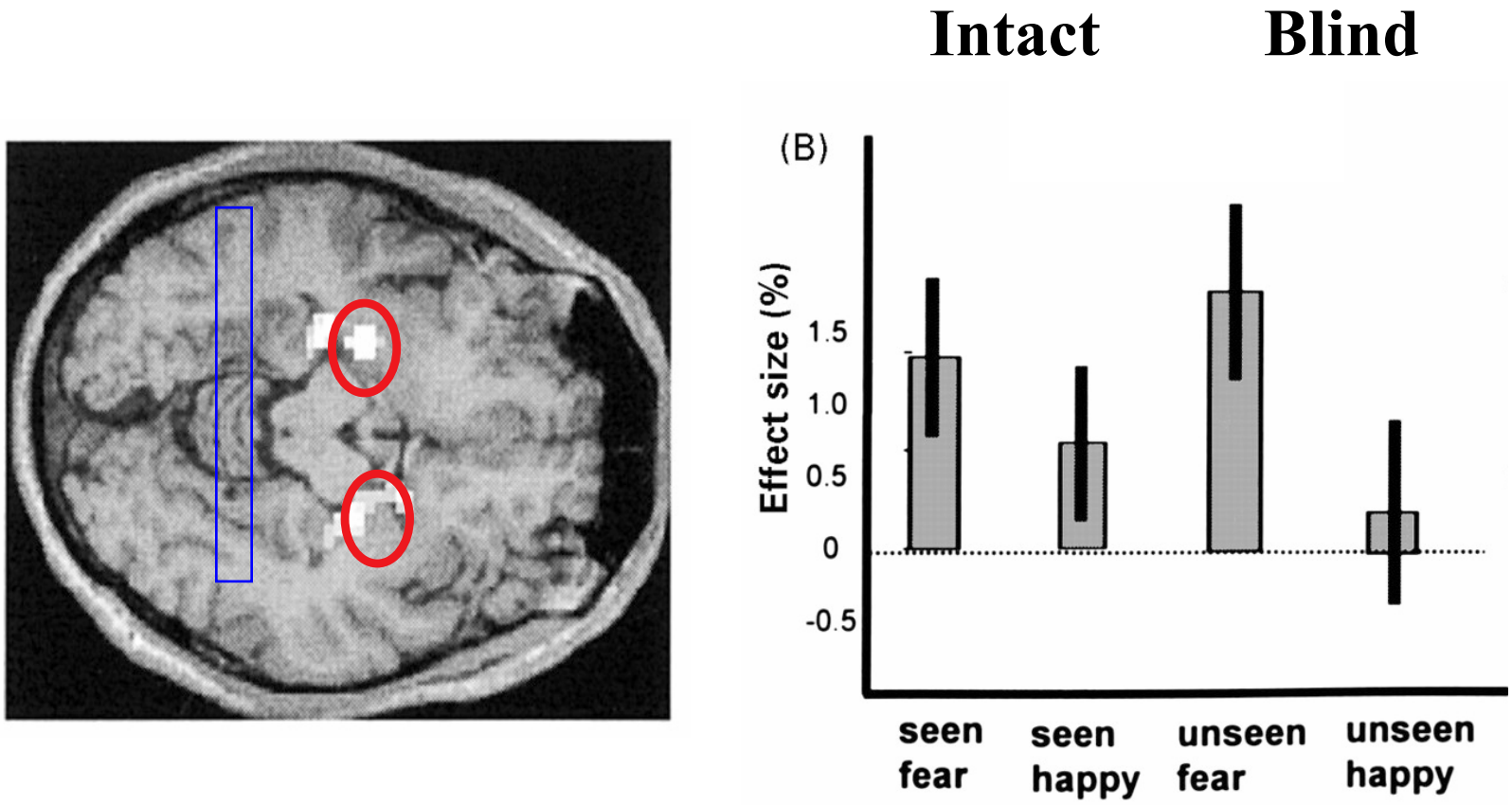


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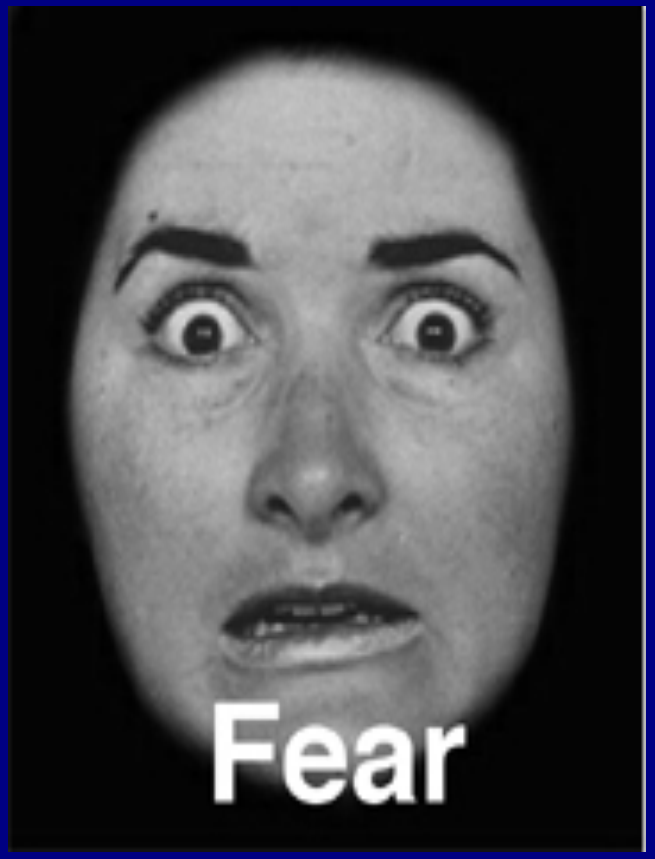
- Stimuli presented to intact and blind hemifield

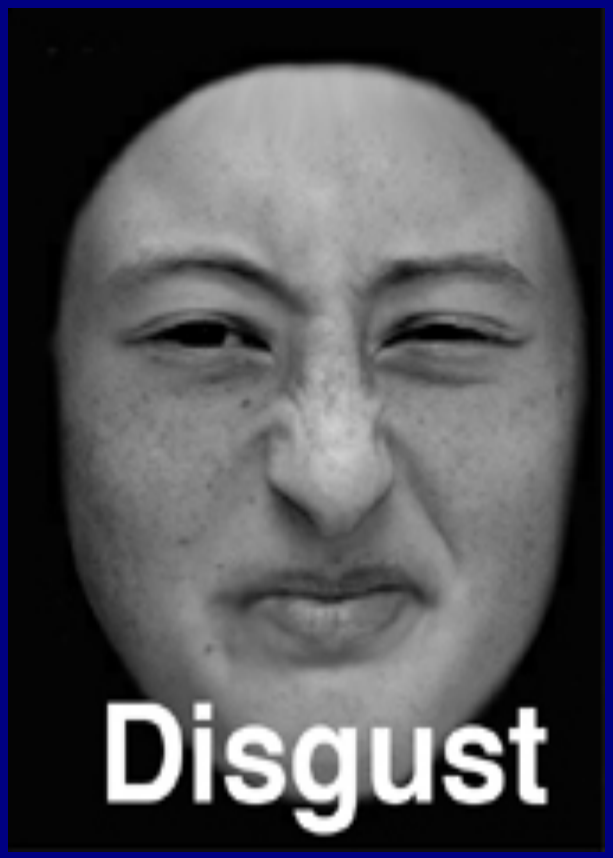
Cortical blindness: Fear blindsight



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- **Amygdala discrimination of fear in blind field**
- **Depends on subcortical thalamo-amygdala pathway**

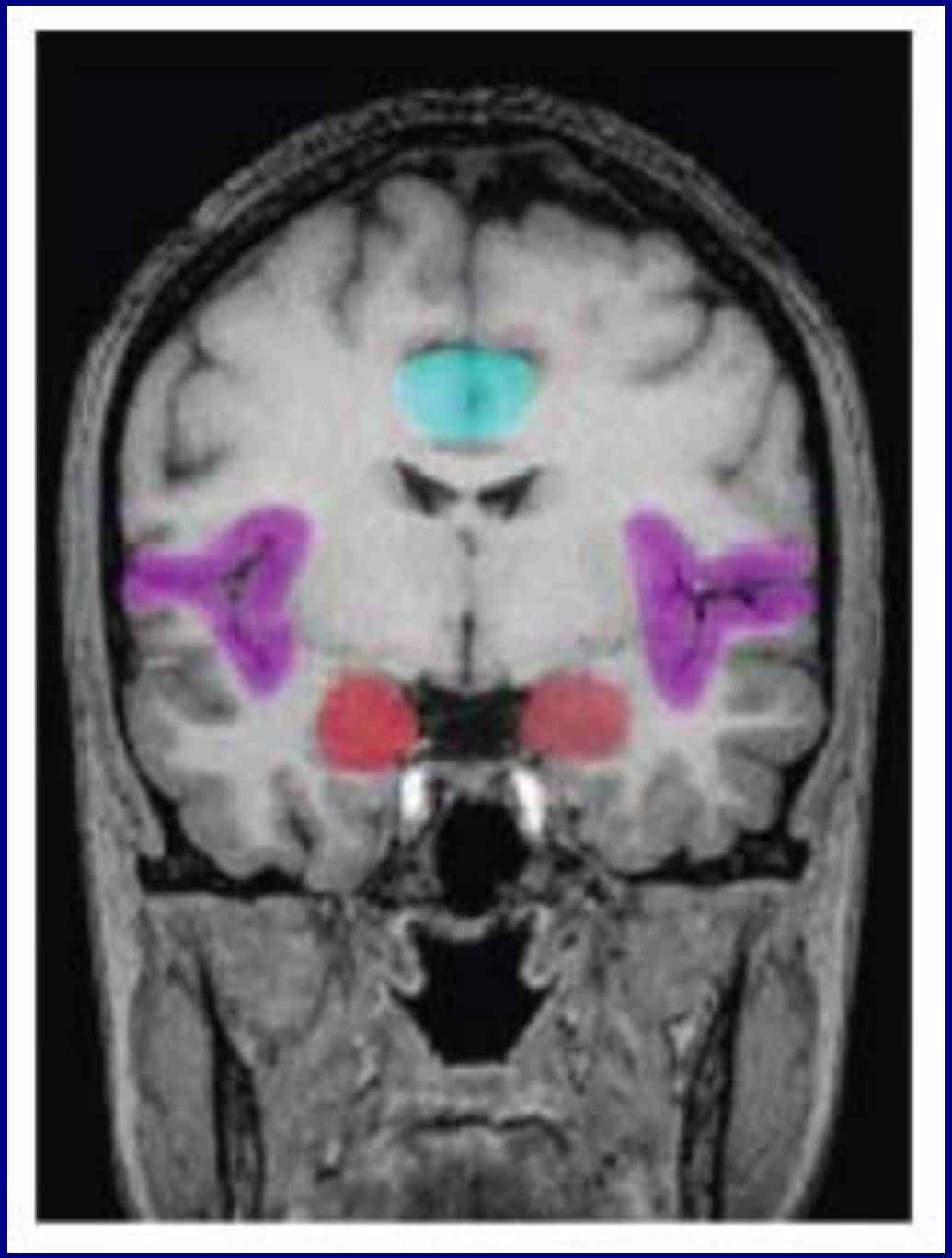




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Threat ? ***Contamination ?***

AMYGDALA **INSULA**



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Insula and Disgust

- **Lesions impair recognition of disgust facial expressions** **(Calder et al., 2000)**

- **Increased fMRI/PET activation for disgust facial expressions** **(Phillips et al., 1997)**

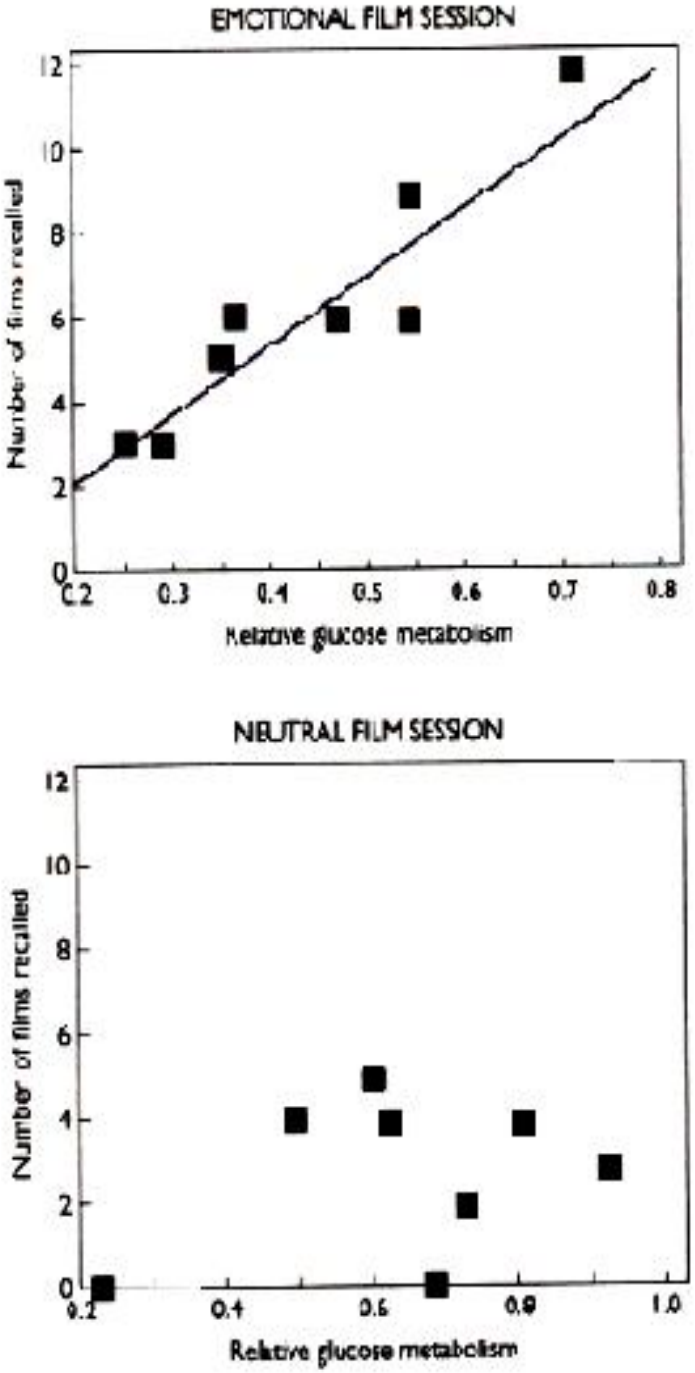


Photo courtesy of Lil' Mike on Flickr used under a cc-by license.

“ The horror of that moment,” the King went on, “I shall never, never, forget.”

“You will though,” the Queen said, “if you don’t make a memorandum of it.”

Lewis Carroll, *Through the Looking Glass,* 1887



Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Cahill, L., et al. "Amygdala Activity at Encoding Correlated with Long-Term, Free Recall of Emotional Information." *Proc Natl Acad Sci USA* 93, no. 15 (1996): 8016–21. Copyright © 1996 National Academy of Sciences, U.S.A.

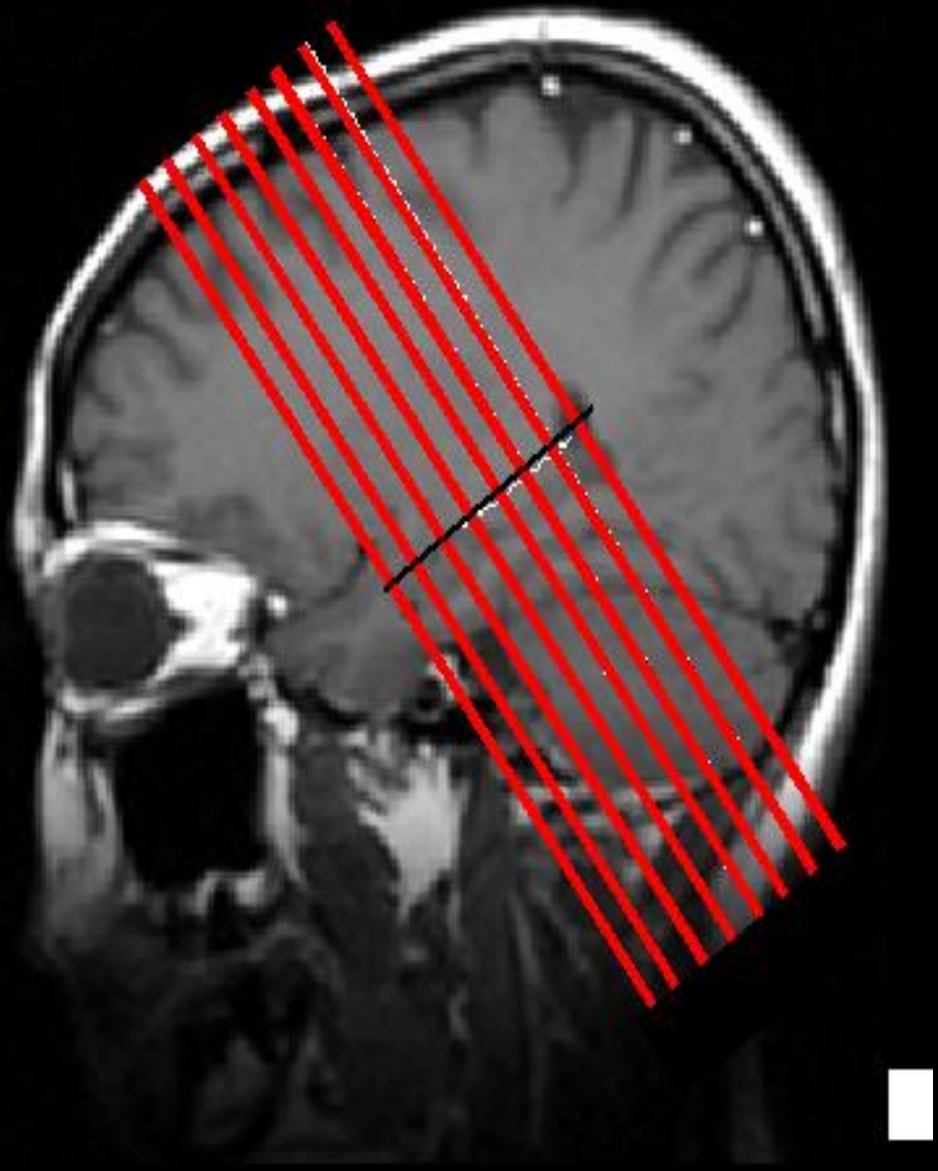
Series of images from the International Affective Picture System removed due to copyright restrictions.





Functional Imaging Parameters

- 10 female subjects
- 1.5 T Scanner
- Standard motion correction
 - (Air 3.0)
- 8 slices, 7 mm thick
 - (perpendicular to hippocampal axia plane)
- Gradient echo spiral pulse sequence
 - TE=40 ms
 - TR=360 ms
 - Flip Angle= 50°
- Bite-bar to minimize motion



Event-Related fMRI Study Design

Encoding in scanner

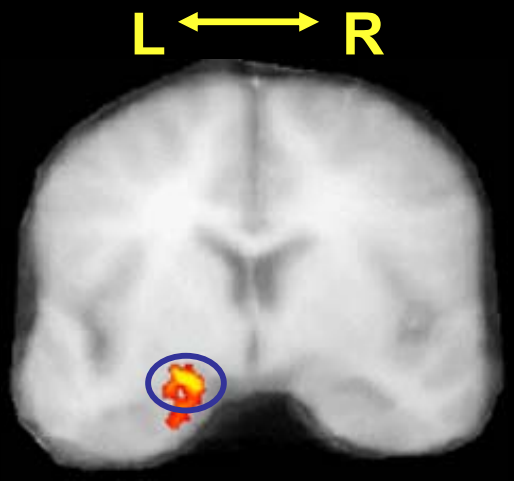
Rating (0-3) of emotional arousal of 96 color scenes (Neutral to Negative)

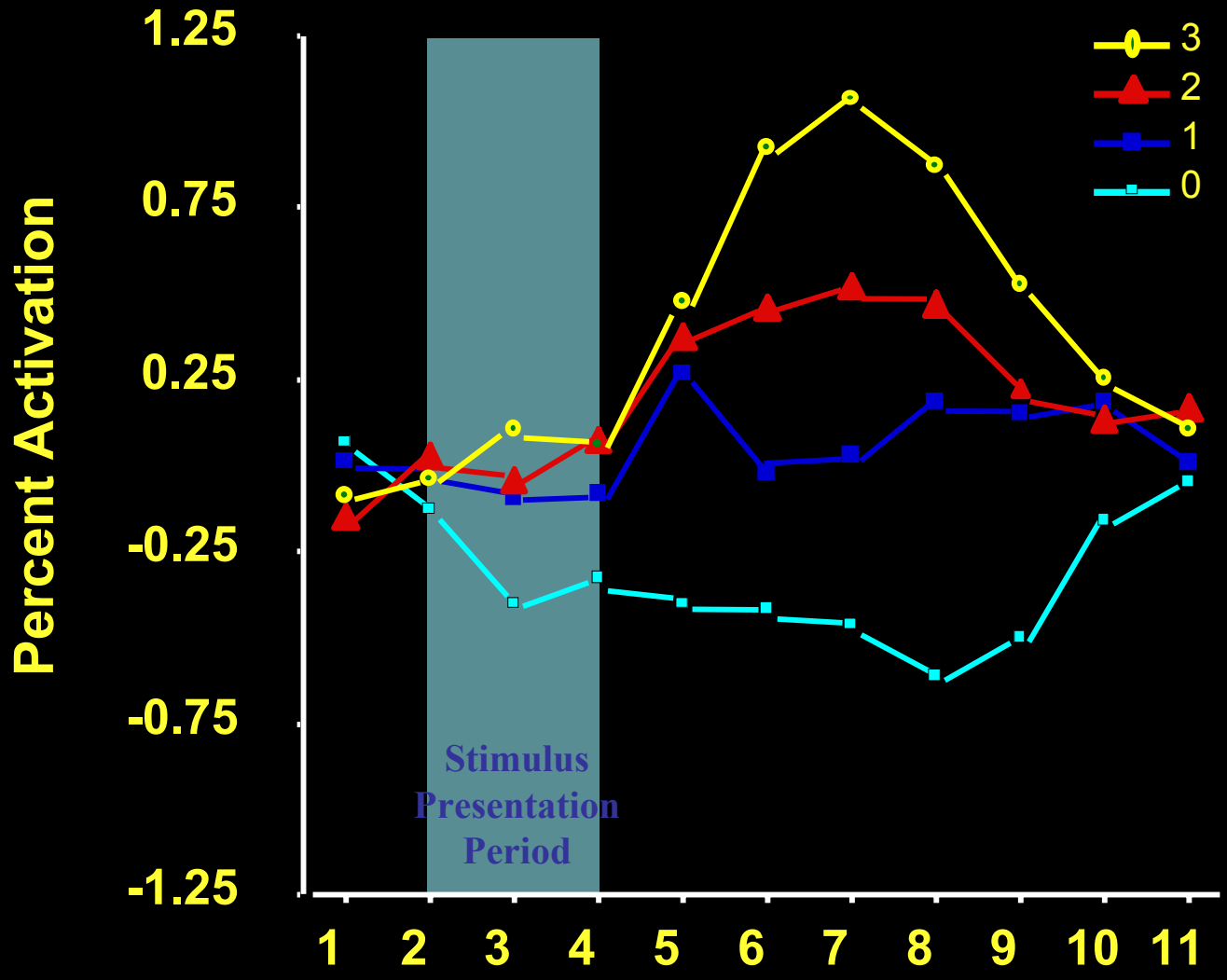
3 week delay

retrieval out of scanner

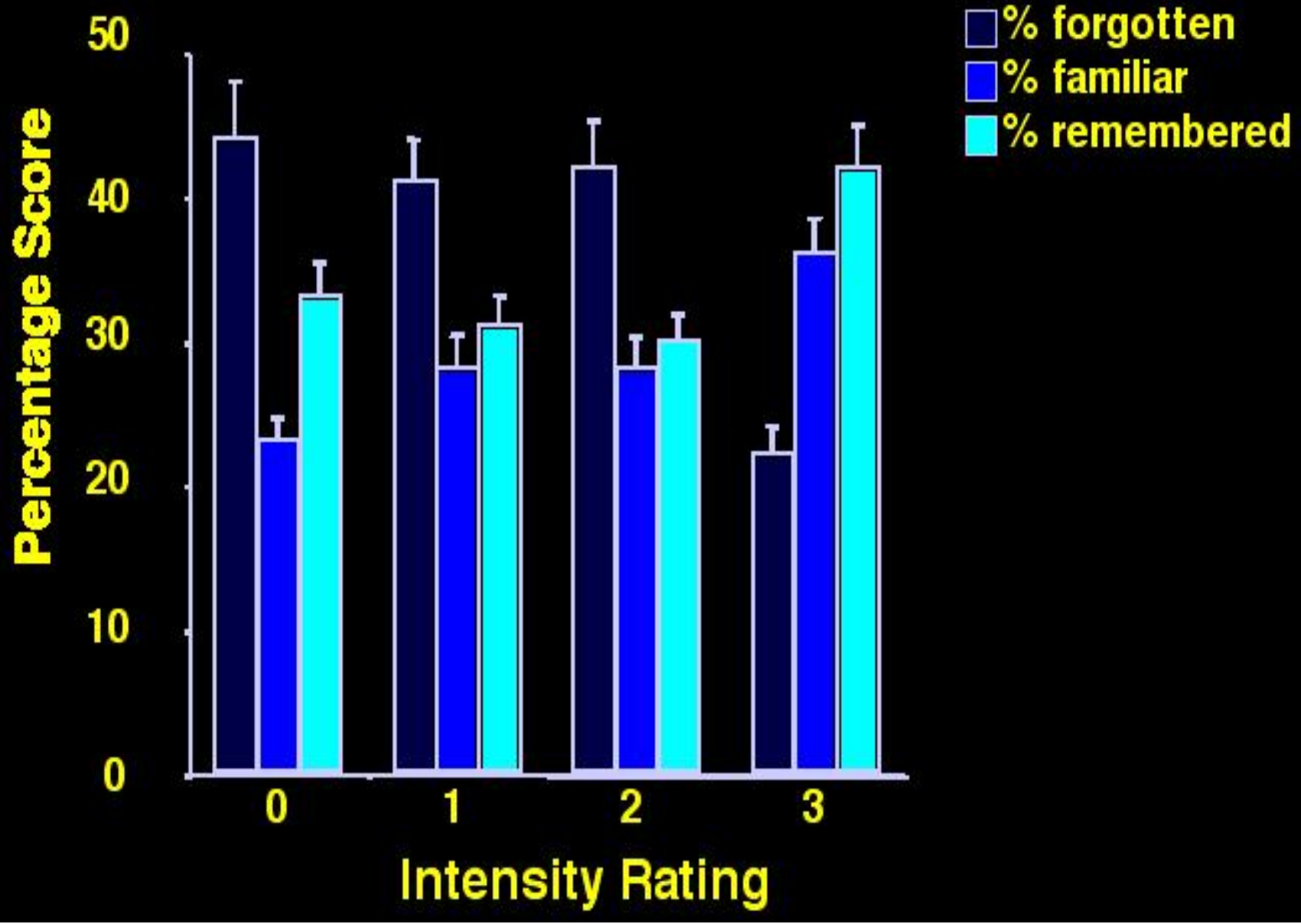
Old/New recognition judgements of 96 old & 48 new scenes
Remembered
Known (familiar)
Forgotten

Emotional Experience

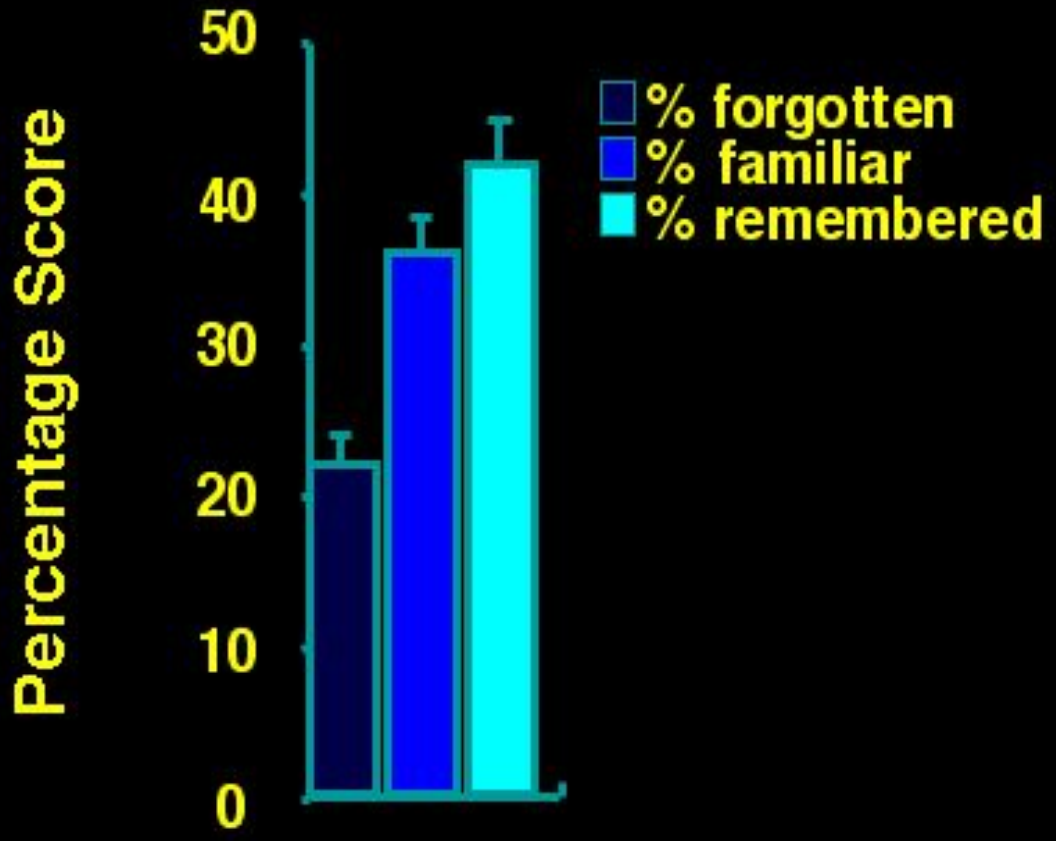


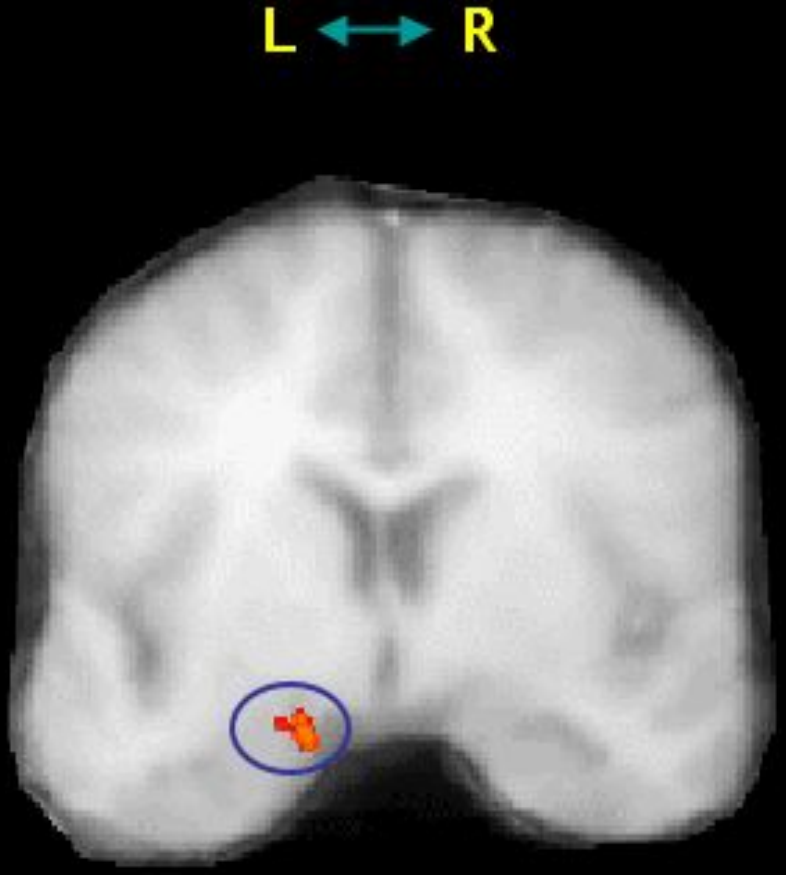


Highly Emotional Items Produced Enhanced Memory

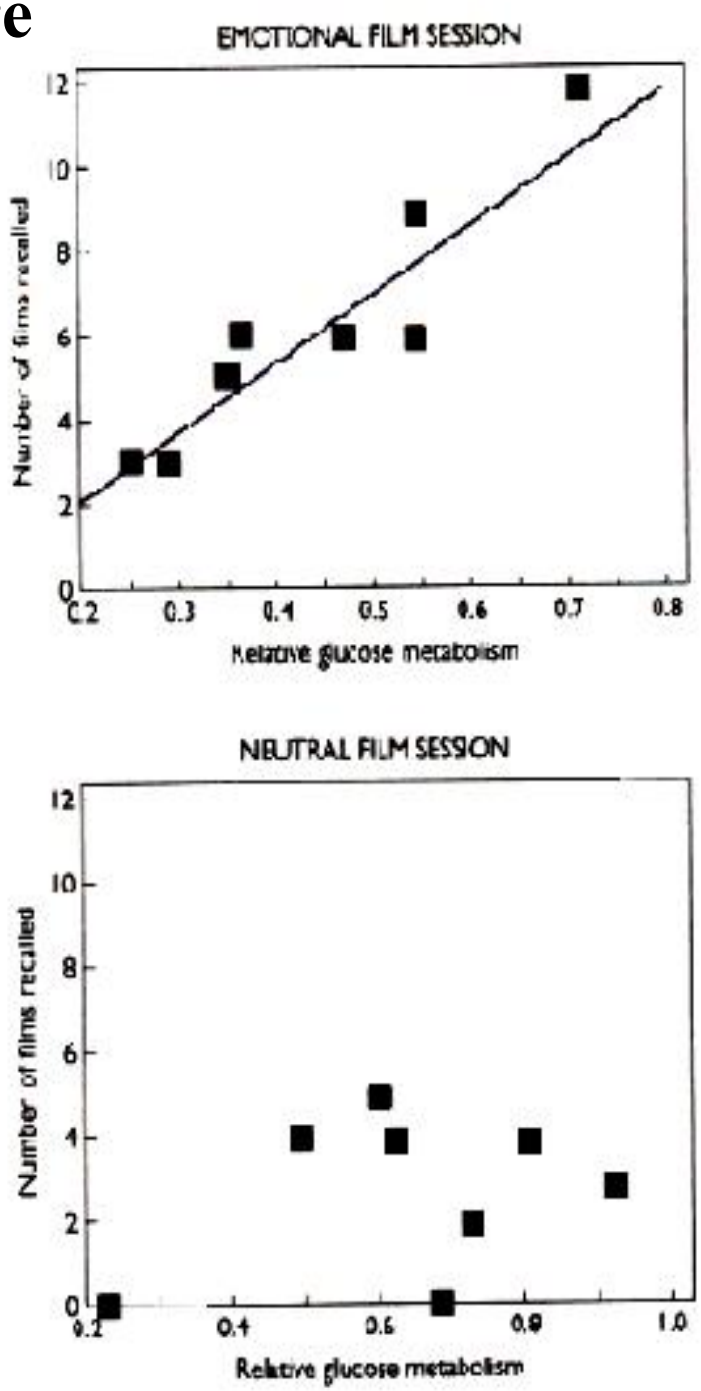


Enhanced Memory Associated with Left Amygdala Activation



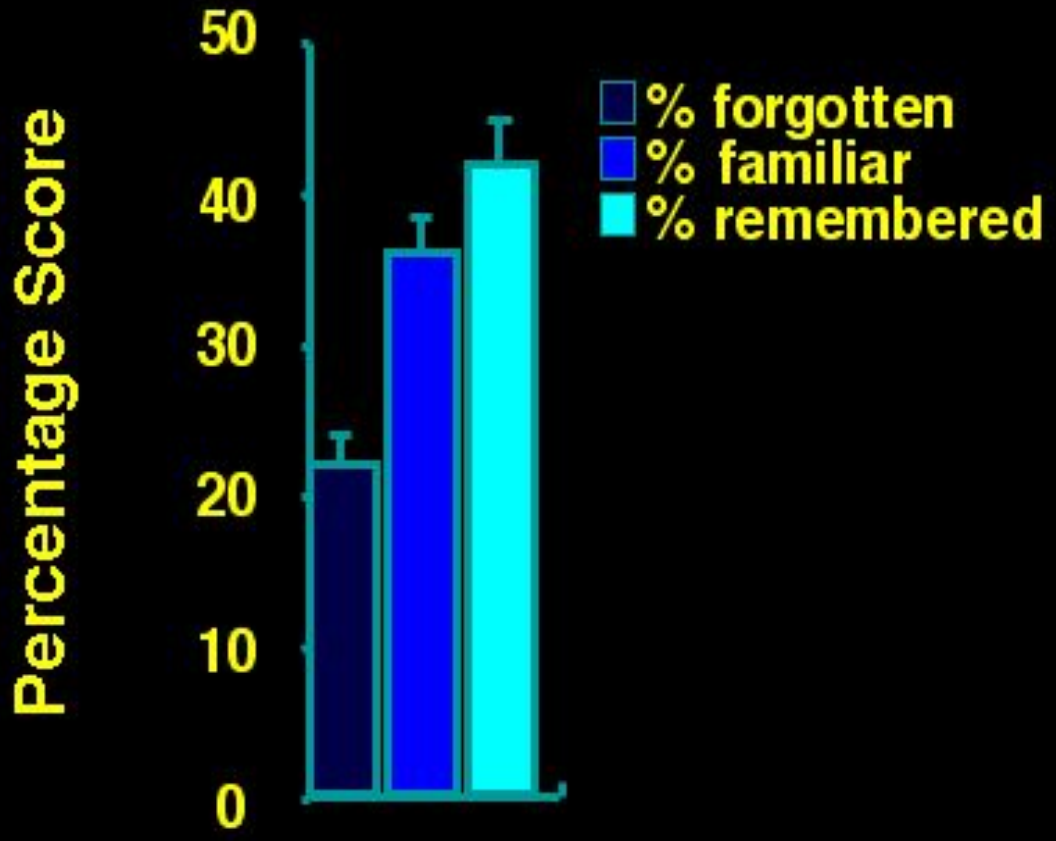


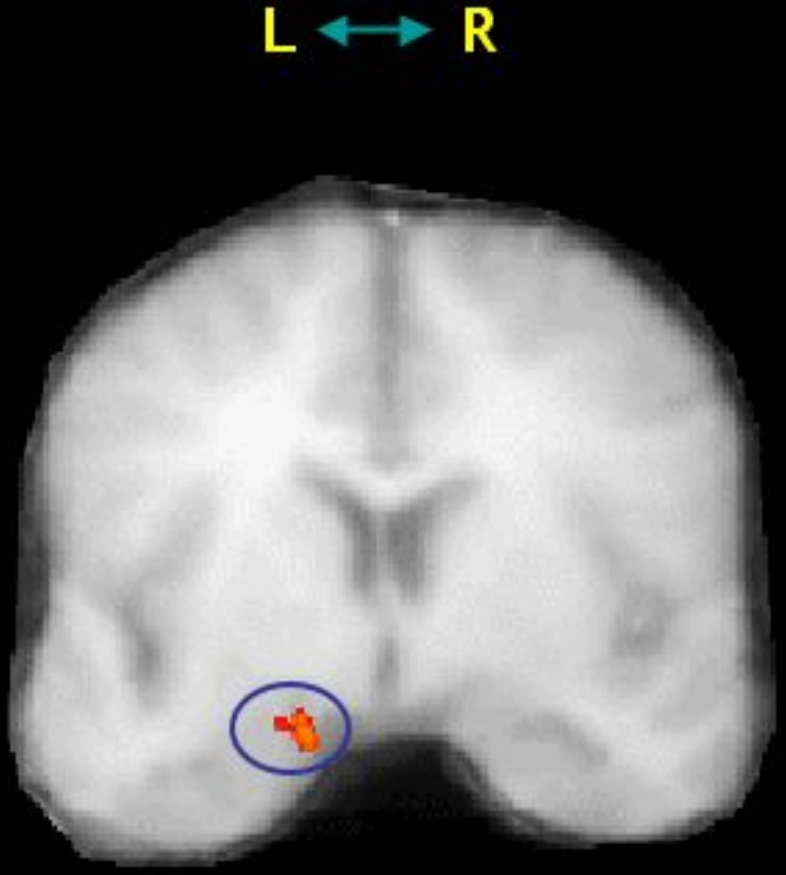
Right Hemisphere



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Enhanced Memory Associated with Left Amygdala Activation





4 Studies

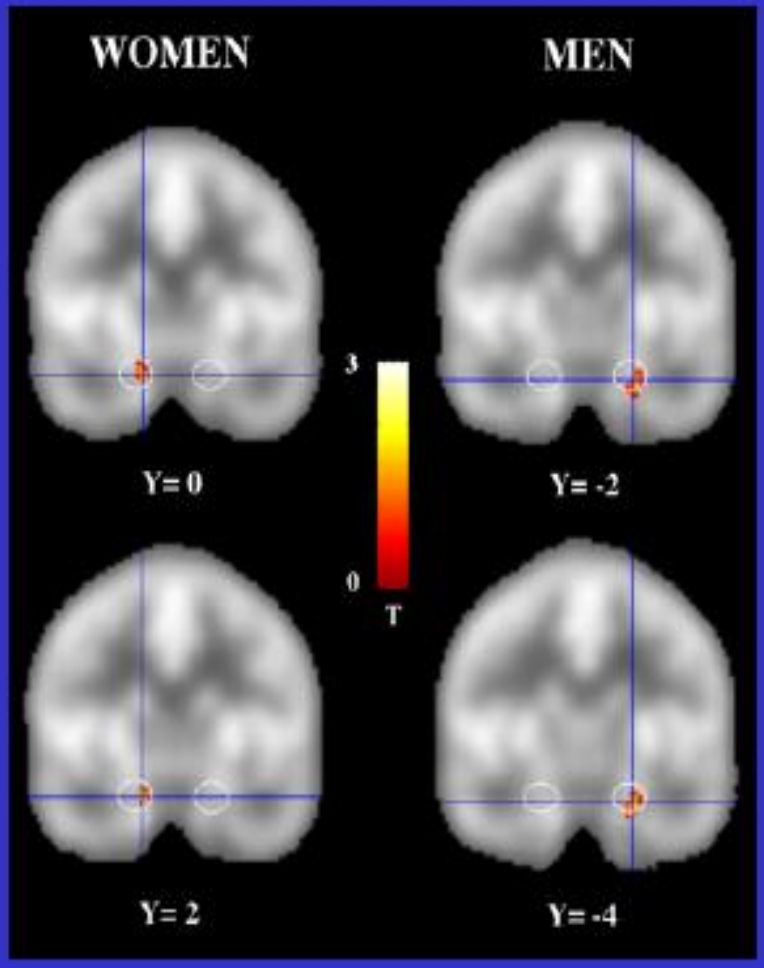
	Left Amygdala Memory Correlation		Right Amygdala Memory Correlation	
Authors	Canli et al. 1999	Canli et al. 2000	Cahill et al. 1996	Hamann et al. 1999
Imaging	fMRI (block)	fMRI (event)	PET	PET
Subjects	10 F	10 F	8 M	10 M
Stimuli	Pictures	Pictures	Films	Pictures
Paradigm	Recog	Recog	Recall	Recall/Recog
Delay	Months	Weeks	Weeks	Minutes/Weeks

Is Gender the Critical Variable?

Women have better memory than men

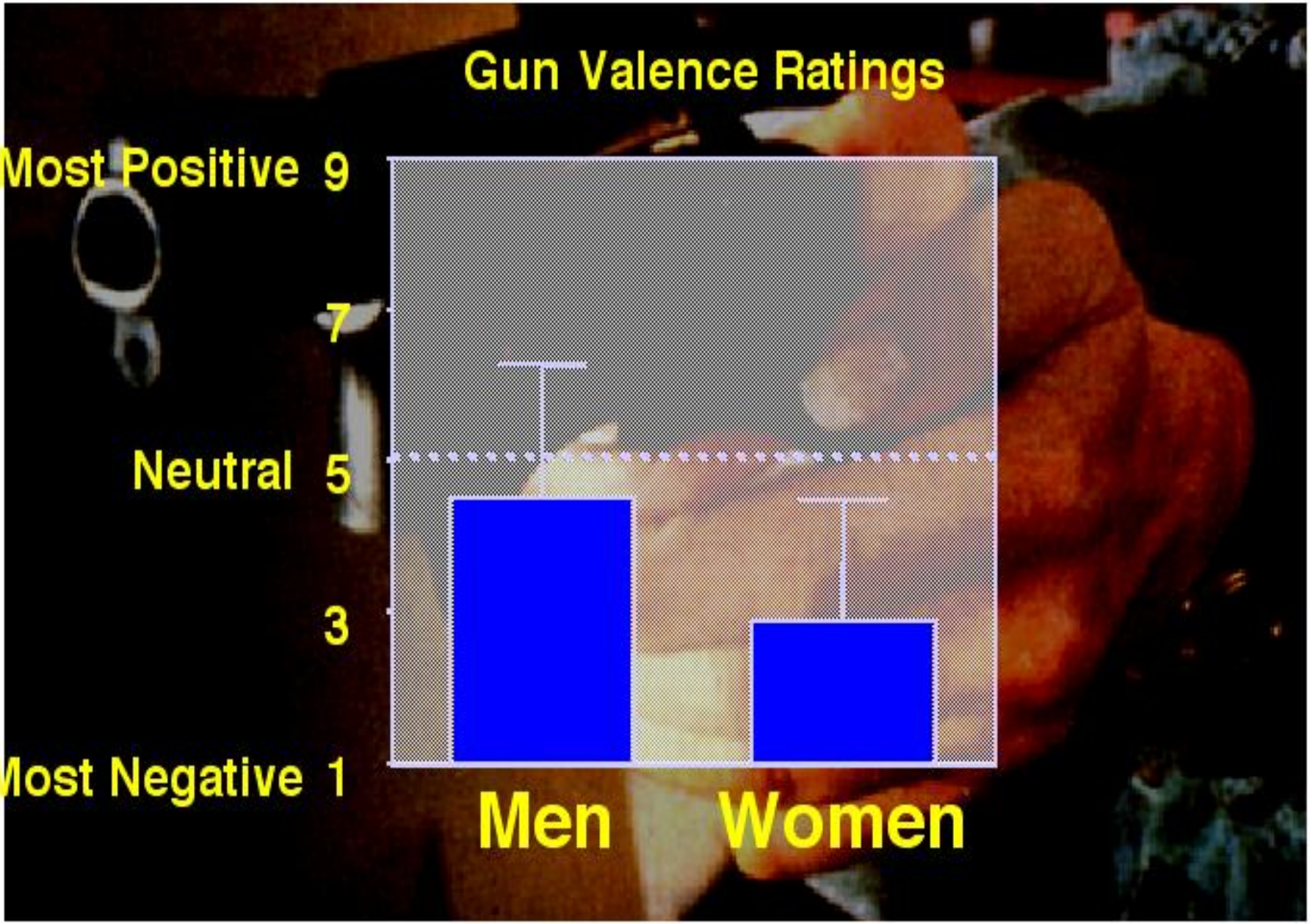
- better recall of emotional life events
- faster production of autobiographical memories to cues
- more accurate in dating memories
- wives score higher than husbands on vividness of memories for first date, last vacation, recent argument

Amygdala activation predicts subsequent memory for emotional experiences

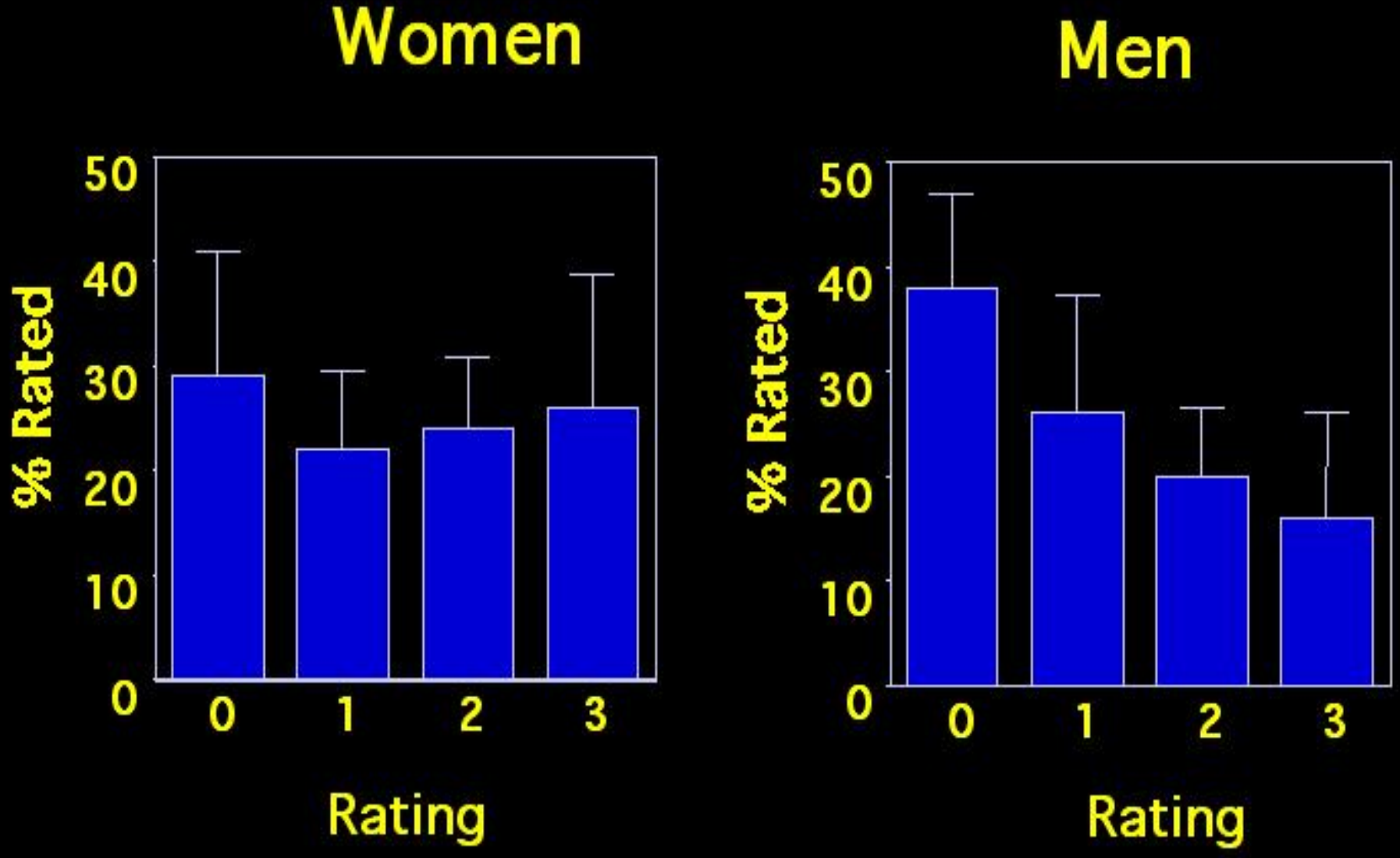


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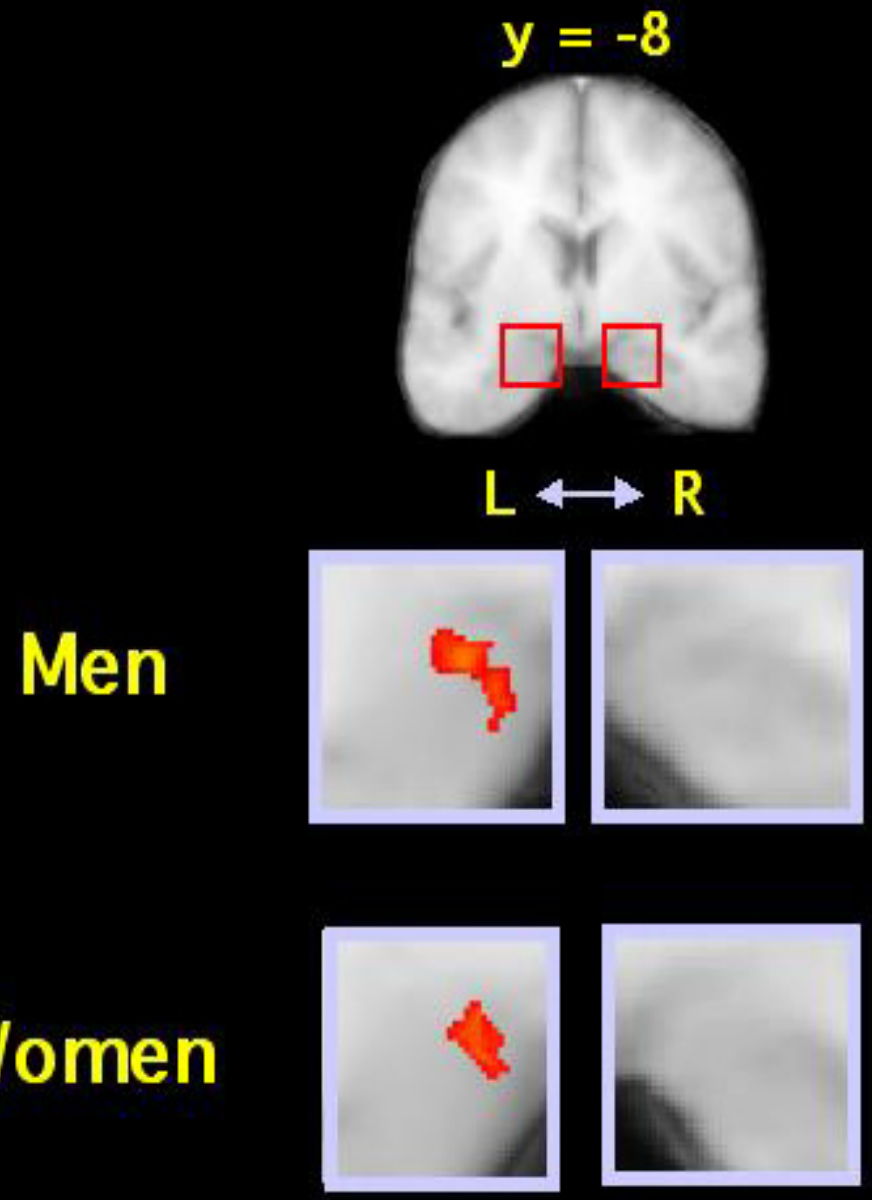
Is Gender the Critical Variable?



Emotional Rating Profiles

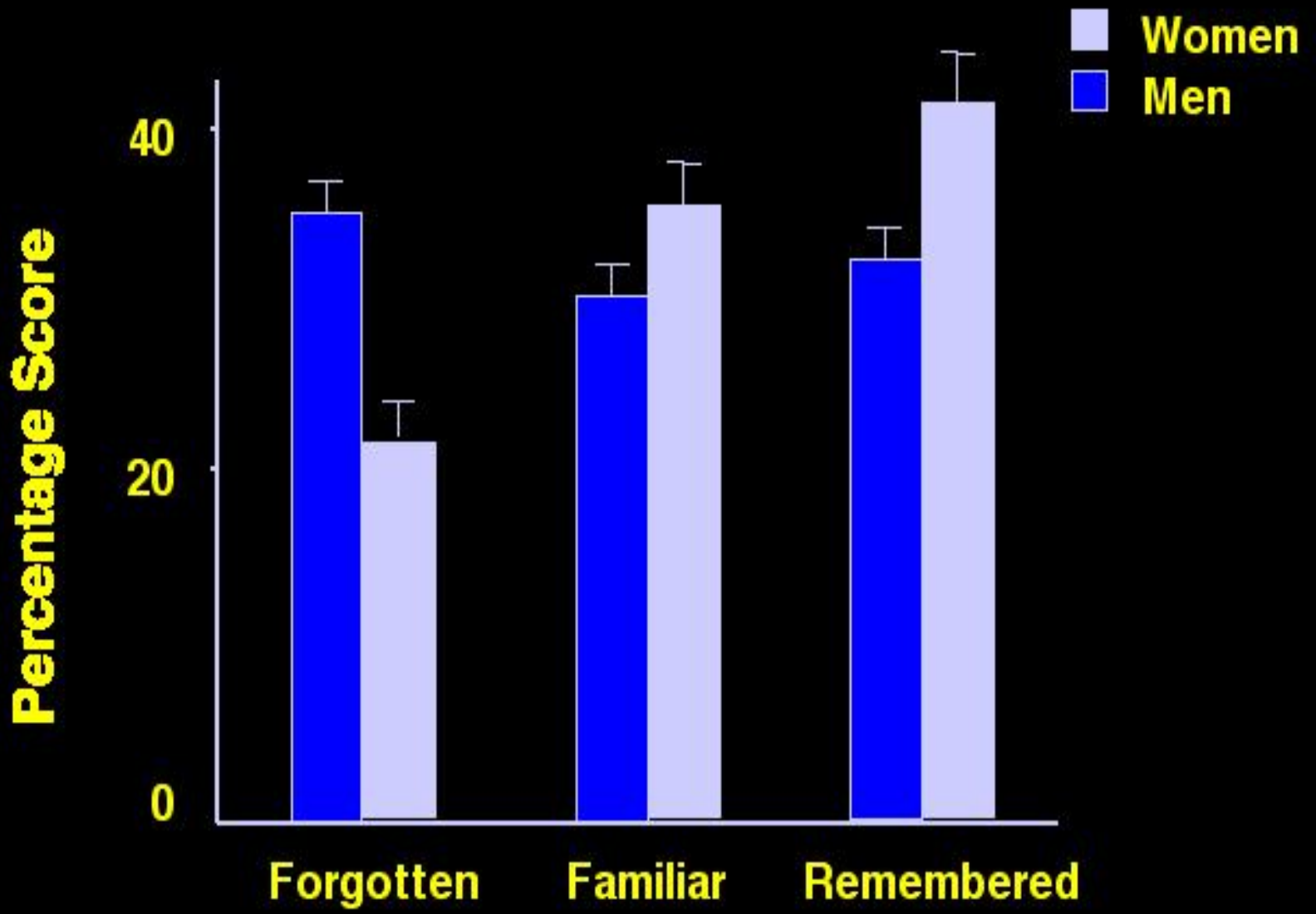


Correlation with Emotional Ratings

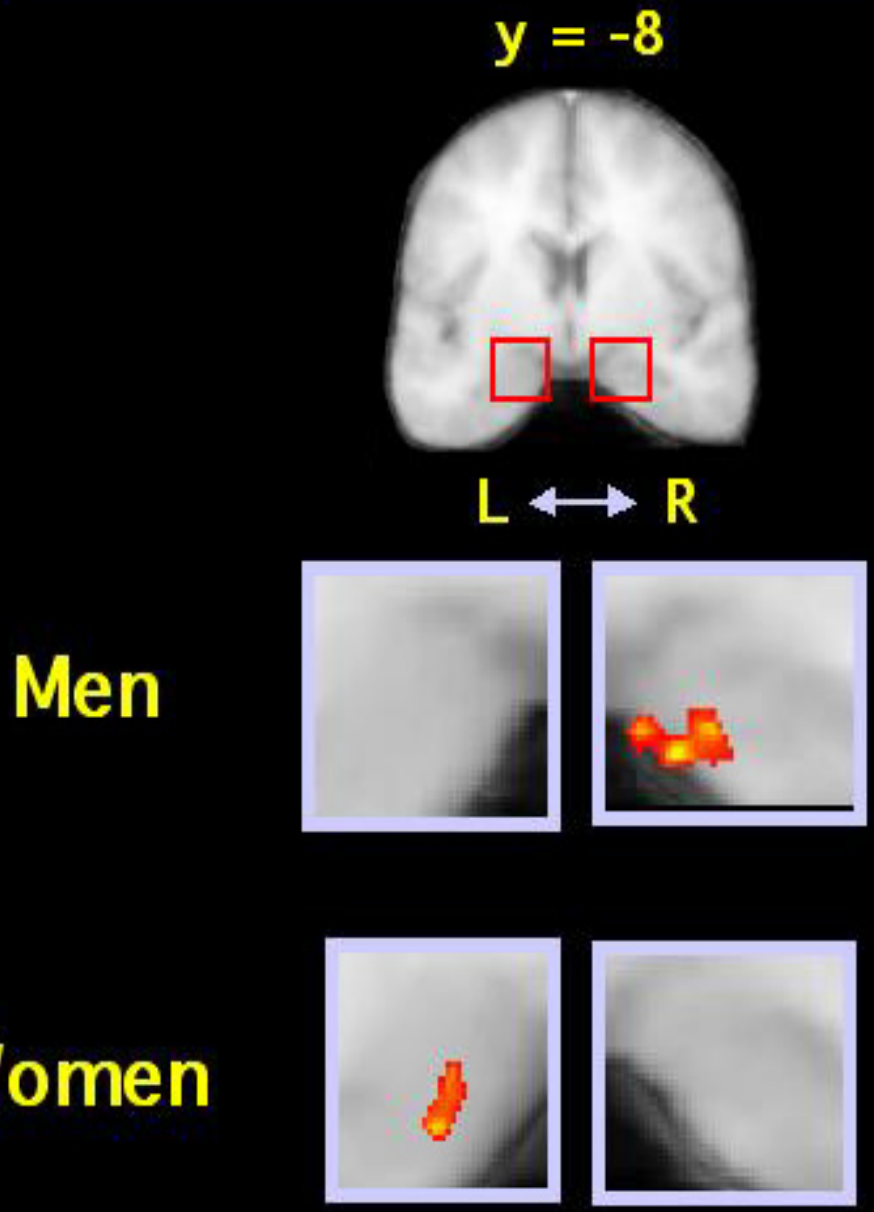


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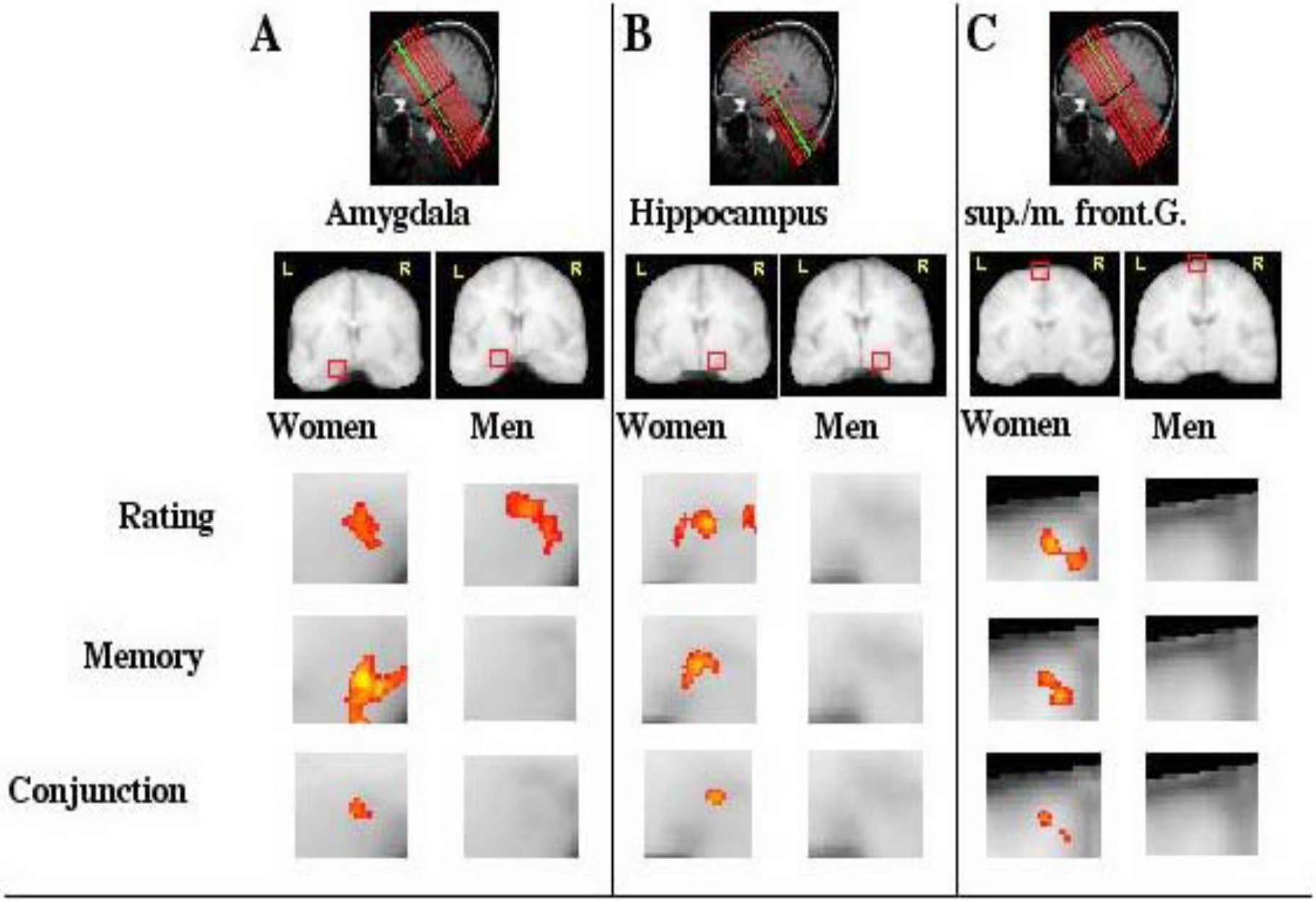
Memory For Most Intense Items



Memory Correlation For Most Intense Items



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Sex Differences in Amygdala Activation and Memory for Emotional Material

- **superior memory for most intense pictures in women**
- **both men and women had greater *left* amygdala activation for pictures rated more intense**
- **in women, greater *left* amygadala activation predicted stronger long-term emotional memories**
- **in men, greater *right* amygadala activation predicted stronger long-term emotional memories**
- **interpretation - both men and women activate brain in response to emotional pictures, but there is, on average, a greater overlap in brain regions involved in analyzing felt emotions and in making memories in women - better memories (and greater risk for depression?)**

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Name: _____ TA: _____

EXAM #2 - SOLUTION KEY
Introduction to Psychology/ 9.00
Spring Semester 2010

Part I. Answer the multiple-choice questions below by selecting **one best** answer and marking the provided answer sheet. It is to your advantage to answer each multiple-choice question, as no penalties are given for incorrect answers.

If you believe that a question or answer is ambiguous (e.g., that there are more equally good answers then you are asked to mark), **mark the best answer** and include a note explaining why you believe the question is ambiguous - your note will be considered in the grading.

Part II. Choose **FIVE** (5) of the Short answer questions. Provide concise, informative responses directly in the space provided on the answer sheet.

Statement of Academic Integrity:

I confirm that the answers I give on this exam represent my own and that I will not engage in:

A. Copying from another's person's examination paper or allowing another person to copy from my paper
B. Unpermitted collaboration during the exam
C. Revising and resubmitting a question for regrading without the instructor's knowledge and consent

Sign this page affirming that you agree with the above statement:

Name :_____

TA :_____

Signature:_____

Date:_____

Name: _____ TA: _____

Lecture and Sacks Questions (1pt each)

1. The number of chunks that can be held in short-term memory is typically conceptualized as
 A. 9 plus or minus 2
 B. 7 plus or minus 2
 C. 5 plus or minus 2
 D. 3 plus or minus 2

B

2. Various factors can help or harm memory. People remember material, like recall of nonsense syllables, better if they sleep 8 hours between study and test than if they are awake for 8 hours between study and test; this result supports the idea of _____. People mix up information when later asked about an event with information from the event itself; this is known as _____. People also remember things better when they study and are tested in the same location as opposed to different locations, which demonstrates _____.
 A. proactive interference; retroactive interference; proactive interference
 B. proactive interference; proactive interference; encoding specificity
 C. retroactive interference; retroactive interference; encoding specificity
 D. retroactive interference; proactive interference; encoding specificity

C

3. Flash-bulb memories refer to memories for emotionally important events for which people feel that the memory is so vivid that it is like a picture. What is NOT true about flash-bulb memories according to research?
 A. One is more likely to remember such an emotionally powerful event than a typical event
 B. Flash-bulb memories are susceptible to distortion
 C. People are exceptionally accurate in assessing the accuracy of their flush-bulb memories
 D. Flash-bulb memories relate both to external perceptions and internal feelings

C

4. A patient with a right-sided removal of the hippocampus would be impaired on which of the following:
 A. short-term verbal memory
 B. long-term verbal memory
 C. short-term visuo-spatial memory
 D. long-term visuo-spatial memory

D

5. Declarative memory depends on the _____; repetition priming depends on the _____; procedural memory depends on _____.
 A. hippocampus; neocortex; basal ganglia
 B. hippocampus; basal ganglia; neocortex
 C. neocortex; basal ganglia; hippocampus
 D. basal ganglia; neocortex; hippocampus

Name: _____ TA: _____

A

6. Monkeys with surgical removals of the hippocampal region have
 A. No retrograde amnesia at all
 B. Temporally limited retrograde amnesia for material learned in the more distant past
 C. Temporally limited retrograde amnesia for material learned in the more recent past
 D. Complete retrograde amnesia

C

7. Which is NOT true about human phonology?
 A. Humans use about 100 phonemes
 B. English has about 45 phonemes
 C. children are born with the capacity to discriminate all phonemes, but start to lose the ability to discriminate phonemes they do not hear after about 12 months
 D. pauses during natural speech generally occur at the ends of words

D

8. Experimental evidence indicates which of the following about lexical access?
 A. all meanings of words are activated for about 500 msec through 2000 msec
 B. all meanings of words are activated for about 500 msec, and then only the relevant meaning is activated at 2000 msec
 C. only relevant meanings of words are activated for about 500 msec through 2000 msec
 D. only relevant meanings of words are activated for about 500 msec, and then all meanings are activated at 2000 msec

B

9. Patients with right or left hemisphere lesions were compared to healthy control subjects in their abilities to interpret (identify) people who are lying through facial expressions alone or through facial expressions and vocal cues. What was found?
 A. Patients with either left or right hemisphere lesions were more accurate than controls
 B. Patients with right hemisphere lesions were more accurate than patients with left hemisphere lesions and healthy people.
 C. Patients with left hemisphere lesions were more accurate than patients with right hemisphere lesions and healthy people.
 D. Patients with right hemisphere lesions were as accurate as controls and more accurate than patients with left hemisphere lesions.

C

10. People incorrectly (a) often think that it is unlikely that two individuals among 30 people will share a birthday; (b) often think that more words begin with the letter “K” than have “K” in the third letter position; and (c) often estimate that the Mississippi River is shorter if they first answer if it is longer or shorter than 500 miles than if they first answer if it is longer or shorter than 5000 miles. These ways of thinking reflect, in order, what heuristics?
 A. (a) framing; (b) anchoring; (c) availability

B. (a) representativeness; (b) framing; (c) availability
C. (a) representativeness; (b) availability; (c) anchoring
D. (a) availability; (b) representativeness; (c) anchoring

C

11. Experimental studies show that, for equal losses or gains, people are
 A. risk averse for losses and gains
 B. risk taking for losses and gains
 C. risk taking for gains and risk averse for losses
 D. risk averse for gains and risk taking for losses

D

12. Perseveration in problem solving is found after injuries to the _____; failure to exhibit a galvanic skin response (GSR) to family members is found after injuries to the _____; a heightened tendency to make selections that have high immediate rewards but higher long-term losses is found after injuries to the
 A. orbitofrontal cortex; orbitofrontal cortex; dorsolateral prefrontal cortex
 B. dorsolateral prefrontal cortex; dorsolateral prefrontal cortex; orbitofrontal cortex
 C. dorsolateral prefrontal cortex; orbitofrontal cortex; dorsolateral prefrontal cortex
 D. dorsolateral prefrontal cortex; orbitofrontal cortex; orbitofrontal cortex

D

13. Which is NOT true about IQ scores according to available evidence?
 A. IQ scores have been rising around the world
 B. crystallized intelligence shows little decline in normal aging
 C. IQ scores, according to twin studies, are about 50-70% heritable
 D. birth order has no effect on IQ scores

D

14. Which is NOT true about psychological and brain mechanisms related to IQ?
 A. performance on IQ-type problems is associated with activation of frontal cortex
 B. normal variation in a single gene can influence brain activation during a working memory task
 C. **people with higher IQ scores typically show greater brain activation than people with lower IQ scores on a working memory task**
 D. people with higher IQ scores typically have faster reaction times on simple tasks than people with lower IQ scores

C

15. Scientists have shown that some factors can hinder performance on tests. Which of these factors does NOT hinder performance?
 A. stereotype threat that is brought to mind by the labeling of the test
 B. a sense that intelligence is a fixed trait that does not grow
 C. praising a child for her or his hard work
 D. praising a child for her or his intelligence

C

16. Lesions to the amygdala in humans result in all EXCEPT
 A. loss of fear conditioning as measured by autonomic (GSR) measures
 B. loss of emotional enhancement of memory
 C. loss of declarative memory for a fear conditioning study
 D. loss of ability to identify fearful facial expressions

C

17. Imaging studies of the amygdala indicate that all of the below EXCEPT
 A. selective response to fearful faces in subliminal presentations
 B. selective response to fearful faces in a cortically blind visual field
 C. greater amygdala activation on the left for emotionally intense scenes that are later remembered by women
 D. greater amygdala activation on the left for emotionally intense scenes that are later remembered by men

D

18. What brain region is associated with the perception of facial expressions of disgust?
 A. insula
 B. amygdala
 C. orbitofrontal cortex
 D. dorsolateral frontal cortex

A

19. Oliver Sacks describes an amnesic patient named “Jimmie G.” The etiology of his amnesia was
 A. surgery for epilepsy
 B. alcoholism
 C. Alzheimer’s disease
 D. Huntington’s disease

B

20. Oliver Sacks describes “Mrs. B” a former research chemist who became facetious and superficial in her interactions with other people. It was discovered hat she has a tumor (carcinoma) in what brain location?
 A. amygdala
 B. basal ganglia
 C. dorsolateral prefrontal cortex
 D. orbitofrontal cortex

D

Book Questions (1pt each)

21. Recalling a fact is an example of _____.
 A. Episodic memory
 B. Semantic memory
 C. Working memory
 D. Implicit memory

B, p. 291

Name: _____ TA: _____

22. Which of the following is NOT a type of implicit memory?
 A. Classically conditioned responses
 B. Operantly conditioned responses
 C. Non-associative learning
 D. Priming

B, p. 293

23. An amnesic patient was hesitant to shake hands with a doctor who had pricked him with a pin the day before. This memory was most likely due to
 A. semantic memory
 B. operant conditioning
 C. classical conditioning
 D. observational learning

C, p. 293

24. Jeremy had a stroke last year, which caused him to be unable to remember how to get to and return from his new doctor's office using a specific route. What brain structure was most likely damaged by Jeremy's stroke?
 A. His amygdala
 B. His hypothalamus
 C. His hippocampus
 D. His cerebellum

C, p. 296

25. The tip-of-the-tongue phenomenon demonstrates what about the nature of memory?
 A. It is fragmentary
 B. Words are stored as whole units
 C. It is organized by sound
 D. It is not systematic

A, p. 302

26. Imagine that the first car you learned to drive was a manual transmission with a clutch, but the car you drive now is an automatic. Sometimes you find yourself reaching for the clutch that is no longer there. This example illustrates _____.
 A. Retroactive interference
 B. Proactive interference
 C. Retrograde amnesia
 D. Anterograde amnesia

B, p. 311

Name: _____ TA: _____

27. What affect, if any, does hypnosis have on memory?
 A. It has no effect.
 B. It increases people's confidence in their memories, but not their accuracy.
 C. It decreases people's confidence in their memories, but not their accuracy.
 D. It decreases both confidence and accuracy.

B, p. 306

28. What disruption to language would you expect in a patient with damage to the inferior frontal lobe of the left hemisphere?
 A. Difficulty recognizing words
 B. Impaired language production
 C. Specific difficulty understanding pragmatic meanings
 D. Trouble discriminating speech sounds

B, p.329

29. Complete this analogy: ***syntax*** is to ***words*** as ***phonology*** is to _____
 A. semantics
 B. letters
 C. phonemes
 D. comprehension

C, p.327

30. Which of the following terms means "a disruption of language caused by brain damage"?
 A. aphasia
 B. dyslexia
 C. ataxia
 D. dysphonia

A, p.329

31. What is a major criticism of strictly empiricist accounts of language acquisition?
 A. Children only produce sentences they have heard before
 B. There is not enough information to learn all the rules of grammar based solely on what children hear
 C. The mechanisms of the "language acquisition device" are not sufficiently specified
 D. These accounts do not make any falsifiable hypotheses

B, p.335

Name: _____ TA: _____

32. Which of the following is good evidence that thinking can involve mental images?
 A. People can describe the colors of a famous painting
 B. People are unable to mentally represent abstract concepts like “liberty”
 C. Tasks that take longer in real space also take longer in mental space
 D. Different brain regions are involved in perception versus imagination

C, p.349-350

33. What is the difference between a *prototype* and a *basic level*?
 A. Prototypes are the most common descriptions of an object, whereas basic levels are the most typical examples of a category.
 B. A prototype may have more than one basic level, but a basic level has only one prototype.
 C. Prototypes are the most typical example of a concept, whereas the basic level is the most common description of an object.
 D. People recognize prototypes most quickly, but are slow to describe the basic level of an object.

C, p.353-355

34. What is a common way to gain *insight* while trying to solve a problem?
 A. Allow the problem to incubate in the back of your mind
 B. Utilize deliberate practice to improve performance
 C. Develop a mental set for viewing the problem
 D. Apply an analogy based on a problem you already solved.

A, p.360

35. At the beginning of the school year, you administer a preliminary test of intellectual capacity (assume validity) to a class of students. Then, you randomly assign the students to two groups: “gifted” and “non-gifted”. You tell the teacher, and not the students themselves, which students are “gifted” and which are not. What would you expect in terms of performance on a follow-up test at the end of the school year? Select the *best* answer.
 A. There will be no difference because students were randomly assigned to the two groups.
 B. “Non-gifted” students *improve* more than “gifted” students because they are motivated to try harder.
 C. “Gifted” students will *improve* less than “non-gifted” students because they are treated as if they do not need to put in effort.
 D. “Gifted” students will *improve* more than “non-gifted” students most likely because the teacher’s expectation leads him/her to treat the two groups differently.

D, p.410-411

Name: _____ TA: _____

36. The term “g” appears to explain most of the variation in performance on many standardized IQ subtests. Which one of the following is true about “g”?
 A. It was revealed by factors analysis, and establishes that there is a specific mental ability underlying “general intelligence”.
 B. It is a statistical abstraction which implies the existence of some underlying process(es) that mediate cognitive performance.
 C. It is attributable to working memory capacity.
 D. It also explains *emotional* IQ.

B. p.389-395

37. Intelligence and creativity appear to be distinct, but interrelated, qualities. However, unlike IQ, differences (between people) in creative ability
 A. are not easily explained by genetic differences.
 B. are not influenced by shared aspects of the home, such as exposure to cultural resources or home libraries.
 C. are not associated with cognitive characteristics such as motivation and high self-esteem
 D. are not influenced by the level of formal education.

A, p.419-420

38. “Expertise” is mainly a function of
 A. Innate talent
 B. Intelligence
 C. Intrinsic motivation
 D. Deliberate practice

D, p. 363

39. Which of the following is NOT true about how concepts are psychologically organized?
 A. The specific conceptual category activated for a given object will depend on the context / task at hand.
 B. Different brain areas will be activated depending on the type of concept.
 C. Conceptual categories are organized according to necessary, but not optional, aspects of a particular situation.
 D. Concepts are organized along different dimensions, such as scripts, taxonomies and evaluations.

C, p.355

Name: _____ TA: _____

40. Which is NOT true about conceptual prototypes?
 A. They may change over time with experience.
 B. They possess the majority of distinct attributes that define the category, such as wings and beaks in birds.
 C. People will name prototypes more quickly than non-prototypes.
 D. Concepts always have an associated prototype.

D, p.353

41. The James-Lang theory of emotion argued that you feel emotions after your body reacts by interpreting physiological changes. Which of the following did the Cannon-Bard theory claim was wrong with the James-Lang theory?
 A. There is a cognitive interpretation of emotion
 B. It often takes longer for the body to respond than it does to feel an emotion
 C. Emotions are not brain based
 D. Emotions provide a somatic marker to interpret as an emotion

B, p. 432-433

42. Which of the following is NOT true of a fear response?
 A. Conscious awareness is essential
 B. Fear interacts with mental processes
 C. People with amygdala damage can still feel fear
 D. Fear responses are often reflexive

A, p. 437-438

43. Which of the following is NOT a core component of emotion?
 A. A positive or negative experience
 B. Bodily arousal
 C. Characteristic behaviors
 D. Instinct

D, p. 429

44. Charles Darwin believed that the outward behavior associated with emotion is:
 A. Inborn
 B. Learned
 C. Independent
 D. Non-existent

A, p. 429

Name: _____ TA: _____

45. It is possible to interpret bodily arousal incorrectly. When this happens, it is called:
 A. Emotional disorder
 B. Cognitive restructuring
 C. Misattribution of arousal
 D. Affect as information

C, p 436

46. People tend to perform best at _____ levels of arousal.
 A. Low
 B. High
 C. Variable
 D. Intermediate

D, p. 451

47. An implicit motive directs behavior _____ .
 A. Unnecessarily
 B. Unconsciously
 C. Toward an unwanted need
 D. Unproductively

B, p. 454

48. Why is child-directed speech thought to be beneficial for infants' language acquisition?
 A. It resembles the kinds of babbling babies do themselves
 B. It allows parents to explicitly correct children's speech errors
 C. It is about topics that are inherently interesting to children
 D. It uses clearer pauses and more careful enunciation than typical speech

D, p.336

49. What is the smallest unit of meaning in a language called?
 A. a morpheme
 B. a word
 C. a propositional representation
 D. a statement

A, p.330

Name: _____ TA: _____

50. Suppose a scientist working in Africa has discovered a troop of monkeys that have a complex communication system. These monkeys make two kinds of sound – howls and grunts – which they combine to make a "call". For example, "howl-grunt" is the call for "snake" and "grunt-grunt" is the call for "leopard". The monkeys never make two howls in a row. Based only on the information here, which aspect of human language is not present in the monkeys' communication?
 A. phonemes
 B. phonology
 C. syntax
 D. semantics

 C, p.328

Name: _____ TA: _____

Short Answer Questions (4 pts each)
(Answer 5 of the following 13 questions)

1. Diffuse, long-lasting emotional states are defined as _____, whereas immediate responses to a specific object or situation are defined as _____. The high or low intensity of an experience is defined as _____, whereas the positive or negative aspects of an experience is defined as _____.

 Mood; Emotion; Arousal; Valence

2. Name two ways that cognition is involved with emotion.
 - By interpreting the emotion and the situation that caused the emotion
 - Comparing to memories of similar situation
 - Categorizing core affect

 p. 433

3. When experiencing emotion, many brain areas including the amygdala and hypothalamus are activated. What additional brain area is activated when trying to regulate emotion? What are three of the negative consequences when trying to control your emotion by suppressing your behavior?
 - The frontal lobe
 - Impairs the ability to reason
 - Impairs your ability to communicate
 - Increases your blood pressure

 p. 443-444

4. Maslow's hierarchy of needs claims that low-level needs that are essential to life must be met before less basic higher level needs can be satisfied. Give four criticisms that argue against Maslow's hierarchy of needs.
 - The levels are not clearly distinct
 - There is not a clear cut order of needs
 - The importance of needs varies across cultures
 - Unmet needs do not always become more important than met needs
 - People often sacrifice safety needs for higher level needs

 p. 456

5. Fill in the blank.
 A problem can often be solved by identifying a _____ which implies a solution. Difficulty in this regard, known as_____, reflects cognitive inflexibility. One way to overcome this difficulty is to "sleep on it", which allows time for _____ and may lead to new _____ into the problem.

Answers: representation, functional fixedness, incubation, insight

Name: _____ TA: _____

6. _____ consists of the processes that guide attention, thought and action in service of accomplishing a specific task. A popular way to study this is known as the _____, where participants name the color of the ink used to print words that name colors. Indeed, brain imaging studies suggest that the conflict resolution required in this task is mediated by a cortical structure in the frontal lobe known as the _____. In addition, such studies have also suggested that the updating of sub-goals (represented in the prefrontal cortex) depends heavily upon _____ signaling.

Answers: Cognitive control, Stroop task, anterior cingulate cortex, dopaminergic

7. Humans are not entirely logical. One common logical mistake in which people incorrectly attribute a specific cause to an observed effect is known as _____. An example of this would be "Japanese _____ eat much fat as, and therefore have fewer heart attacks than, Westerners". Another common logical mistake is known as confirmation bias, where people fail to consider what it would take to _____ a rule. For example, if you were given the rule "If a card has a vowel on one side, then it will have an even number on the other side", which cards (below) would you have to turn over in order to confirm that this rule is true?



Answers: Affirming the consequent, do not, refute/disconfirm, A and 7

8. Ambiguous sentences are those that can take more than one meaning. Give two examples of sentences that are ambiguous: one which is ambiguous due to only the ***semantics*** *of a single word*, and another that is ambiguous due only to its ***syntax***. For each, explain the ambiguity and identify the two (or more) possible interpretations.

Answers: e.g. "I sat down by the bank" where "bank" can mean either the side of the river or a building where people keep money. "I saw the man with a telescope"

where “with a telescope” can describe either how he was seen or what he was carrying (p329-331)

9. During language acquisition, children often make ***underextension*** or ***overextension*** errors. Give one example of each of these types of error, and explain what meaning a child might have for a word that would cause such an error to occur.

Answers: e.g.
underextension: refusing to use “dog” to refer to other dogs, because “dog” means just the family’s pet Fido;
overextension: using the word “dog” to refer to both cows and dogs, because “dog” means any four legged animal
p337-338.

10. (1) Describe the principal difference between an *algorithm* and a *heuristic*. (2) Give an example of one problem and explain how it can be solved using either an (3) algorithm or (4) heuristic.

Answers: An algorithm is guaranteed to arrive at a correct solution, while a heuristic is shortcut that will likely lead to a satisfactory solution. E.g., when deciding what flavor of ice cream to purchase, you can either sample every single flavor to select your favorite (algorithm), or you can choose from among a limited set based on flavors you already know you like (heuristic). (p358)

11. *This question has been removed.*

12. Name the part of Baddeley’s three-component model of working memory that would be used in each of the following tasks.

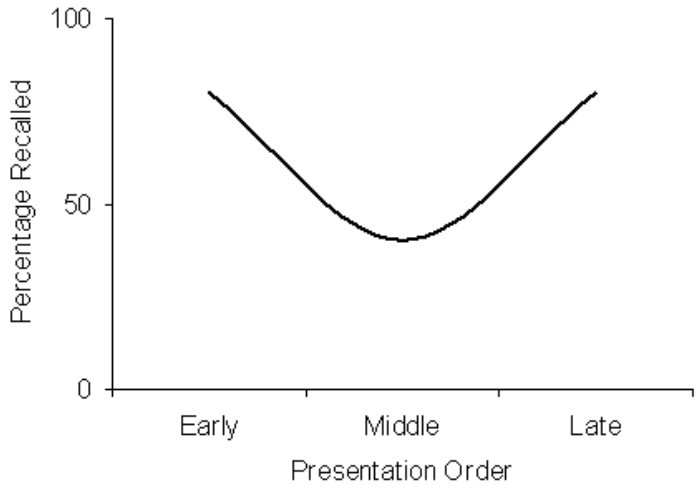
a) rehearsing the digits in a phone number so that you can dial it
b) mentally rotating a letter in order to tell whether it is presented forwards or backwards
c) thinking about how to get to the library by trying to see the route in your mind
d) planning a schedule for the week

Name: _____ TA: _____

Answers: phonological loop, visuospatial sketchpad, visuospatial sketchpad, central executive

13. The memory curve below illustrates the serial position effect, consisting of better memory for the items present at the beginning of a list, known as the (a) _____ effect, and at the end of a list, known as the (b) _____ effect. The serial position effect provides evidence that different kinds of memory rely on different stores. Specifically, (a) above relies on (c) _____ memory, and (b) above relies on (d) _____ memory.

Answers: primacy, recency, long-term, short-term



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PERSONALITY

John Gabrieli

9.00

Personality

1. Definition - What is it?
2. Personality Factors
3. Traits, States, Contexts
4. Brain Correlates of Personality

INDIVIDUALITY

Every person is in certain respects:

- **Like all other persons,**
- **Like some other persons,**
- **Like no other person.**

adapted from Kluckhohn & Murray, 1948

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Personality

A set of behavioral, emotional, and cognitive tendencies that people display *over time* and *across situations* and that *distinguish individuals from one another*.

Personality

A set of behavioral, emotional, and cognitive tendencies that people display *over time* and *across situations* and that *distinguish individuals from one another*.

- **TRAITS (constant, continuum)**
- **STATES (temporary)**
- **SITUATIONS (contexts)**

Personality

- **18,000 terms for personality**

affable, agreeable, amiable, amicable, congenial, convivial, cordial, friendly, genial, sociable, welcoming

- ***trait theory - manageable set of personality dimensions***

Personality

How can we measure?

- **Interview**
- **Observation**
- **Inventory/Questionnaire**

 Factor Analysis

 Big Five Personality Dimensions

Factor Analysis

- **analyze patterns of correlation to extract factors that underlie the correlations**

- ***carefree, compliant, dependable, hard-working, kind, rude, trusting*** **on a 1-5 scale (social desirability concern)**

Hypothetical matrix of correlations among adjectives used as personality self-descriptions

Self-Description	Compliant	Dependable	Hard-Working	Kind	Rude	Trusting
Carefree	-.11	-.60	-.43	+.01	+.21	+.17
Compliant	–	+.29	+.13	+.39	-.70	+.53
Dependable		–	+.49	+.19	-.13	+.17
Hard-Working			–	+.08	-.11	+.09
Kind				–	-.65	+.55
Rude					–	-.48
Trusting						–

Chart showing possible correlations among adjectives used to describe personality in oneself.

Image by MIT OpenCourseWare.

Factor Analysis

- analyze patterns of correlation to extract factors that underlie the correlations - independent factors

- label the factor (dimension)

"conscientiousness"

carefree, dependable, hard-working

"agreeableness"

compliant, kind, rude

Costa and McCrae's (1992) NEO PI-R Facets

	Big Five Dimensions	Facet (and correlated trait adjective)
O	Openness versus closedness to experience	Ideas (curious) Fantasy (imaginative) Aesthetics (artistic) Actions (wide interests) Feelings (excitable) Values (unconventional)
C	Conscientiousness versus lack of direction	Competence (efficient) Order (organized) Dutifulness (not careless) Achievment striving (thorough) Self-discipline (not lazy) Deliberation (not impulsive)
E	Extraversion versus introversion	Gregariousness (sociable) Assertiveness (forceful) Activity (energetic) Excitement-seeking (adventurous) Warmth (outgoing)
A	Agreeableness versus antagonism	Trust (forgiving) Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not show-off) Tender-mindedness (sympathetic)
N	Neuroticism versus emotional stability	Anxiety (tense) Angry hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability (not self-confident)

Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission. Source: Costa, P., and R. McCrae. "Four Ways Five Factors Are Basic." *Personality and Individual Differences* 13, no. 6 (1992): 653-65.

The Big Five Inventory (BFI)

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1. Disagree strongly
2. Disagree a little
3. Neither agree nor disagree
4. Agree a little
5. Agree strongly

I See Myself as Someone Who…

__1. Is talkative
__2. Tends to find fault with others
__3. Does a thorough job
__4. Is depressed, blue
__5. Is original, comes up with new ideas
__6. Is reserved
__7. Is helpful and unselfish with others
__8. Can be somewhat careless
__9. Is relaxed, handles stress well
__10. Is curious about many different things
__11. Is full of energy
__12. Starts quarrels with others
__13. Is a reliable worker
__14. Can be tense
__15. Is ingenious, a deep thinker
__16. Generates a lot of enthusiasm
__17. Has a forgiving nature
__18. Tends to be disorganized
__19. Worries a lot
__20. Has an active imagination
__21. Tends to be quiet
__22. Is generally trusting
__23. Tends to be lazy
__24. Is emotionally stable, not easily upset
__25. Is inventive
__26. Has an assertive personality
__27. Can be cold and aloof
__28. Perseveres until the task is finished
__29. Can be moody
__30. Values artistic, aesthetic experiences
__31. Is sometimes shy, inhibited
__32. Is considerate and kind to almost everyone
__33. Does things efficiently
__34. Remains calm in tense situations
__35. Prefers work that is routine
__36. Is outgoing, sociable
__37. Is sometimes rude to others
__38. Makes plans and follows through with them
__39. Gets nervous easily
__40. Likes to reflect, play with ideas
__41. Has few artistic interests
__42. Likes to cooperate with others
__43. Is easily distracted
__44. Is sophisticated in art, music, or literature

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Please check: Did you write a number in front of each statement?

BFI scale scoring ("R" denotes reverse scored items):

Extraversion: 1, 6R, 11, 16, 21R, 26, 31R, 36; Agreeableness: 2R, 7, 12R, 17, 22, 27R, 32, 37R, 42; Conscientiousness: 3, 8R, 13, 18R, 23R, 28, 33, 38, 43R; Neuroticism: 4, 9R, 14, 19, 24R, 29, 34R, 39; Openness: 5, 10, 15, 20, 25, 30, 35R, 40, 41R, 44

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The Big Five Inventory (BFI)

Conscientiousness

I See Myself as Someone Who…

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__3. Does a thorough job
__4. Is depressed, blue
__5. Is original, comes up with new ideas
__6. Is reserved
__7. Is helpful and unselfish with others
__8. Can be somewhat careless
__9. Is relaxed, handles stress well
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__11. Is full of energy
__12. Starts quarrels with others
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Measures of Personality

- are they stable across life?

- do they predict behaviors and outcomes?

Measures of Personality

- correlated .50 to .70 across 30 or 40 years (height & sex correlate .40)

- increases with age (7-year periods)

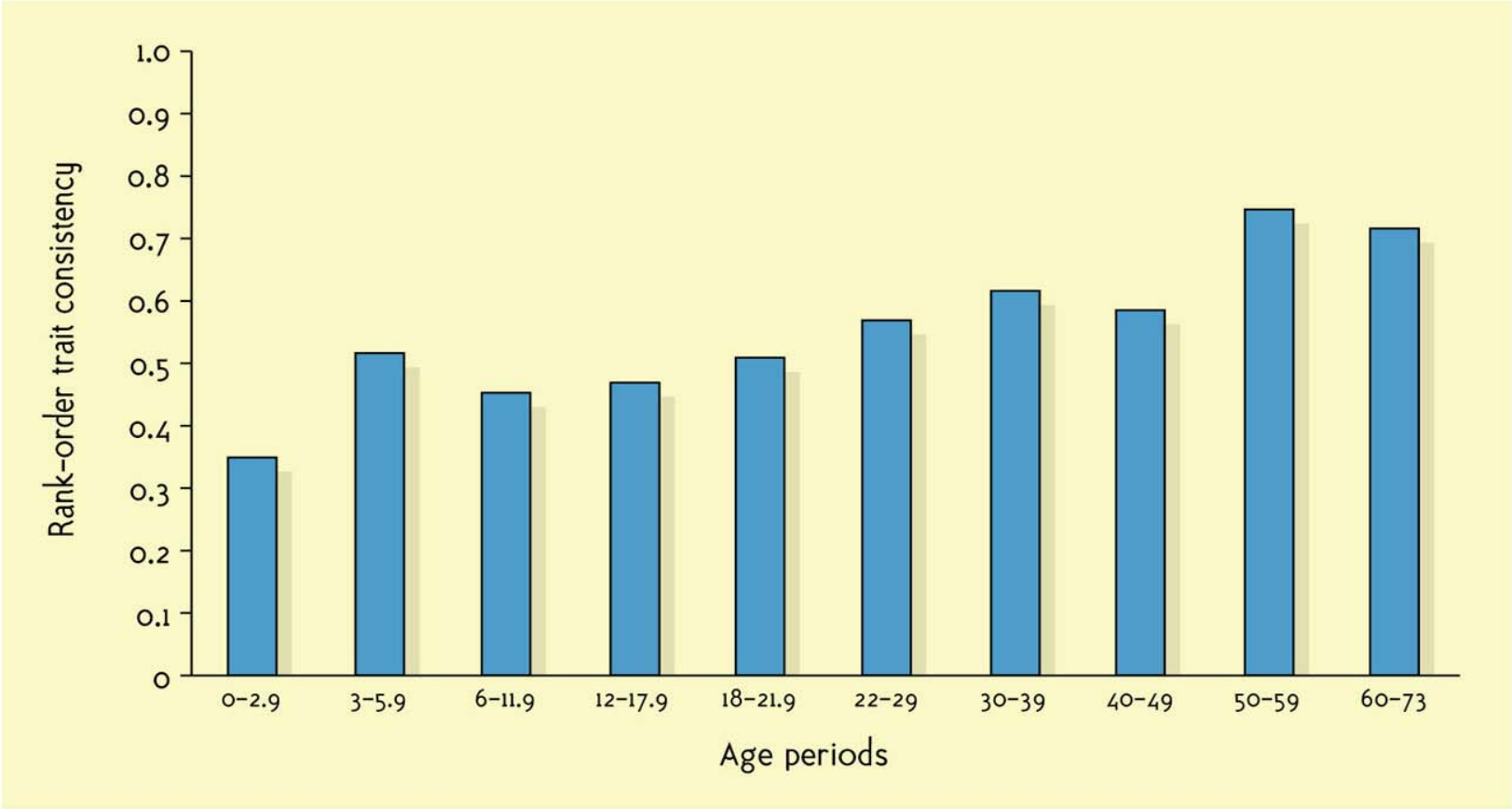
 childhood - .31

 young adulthood - .54

 age 30 - .64

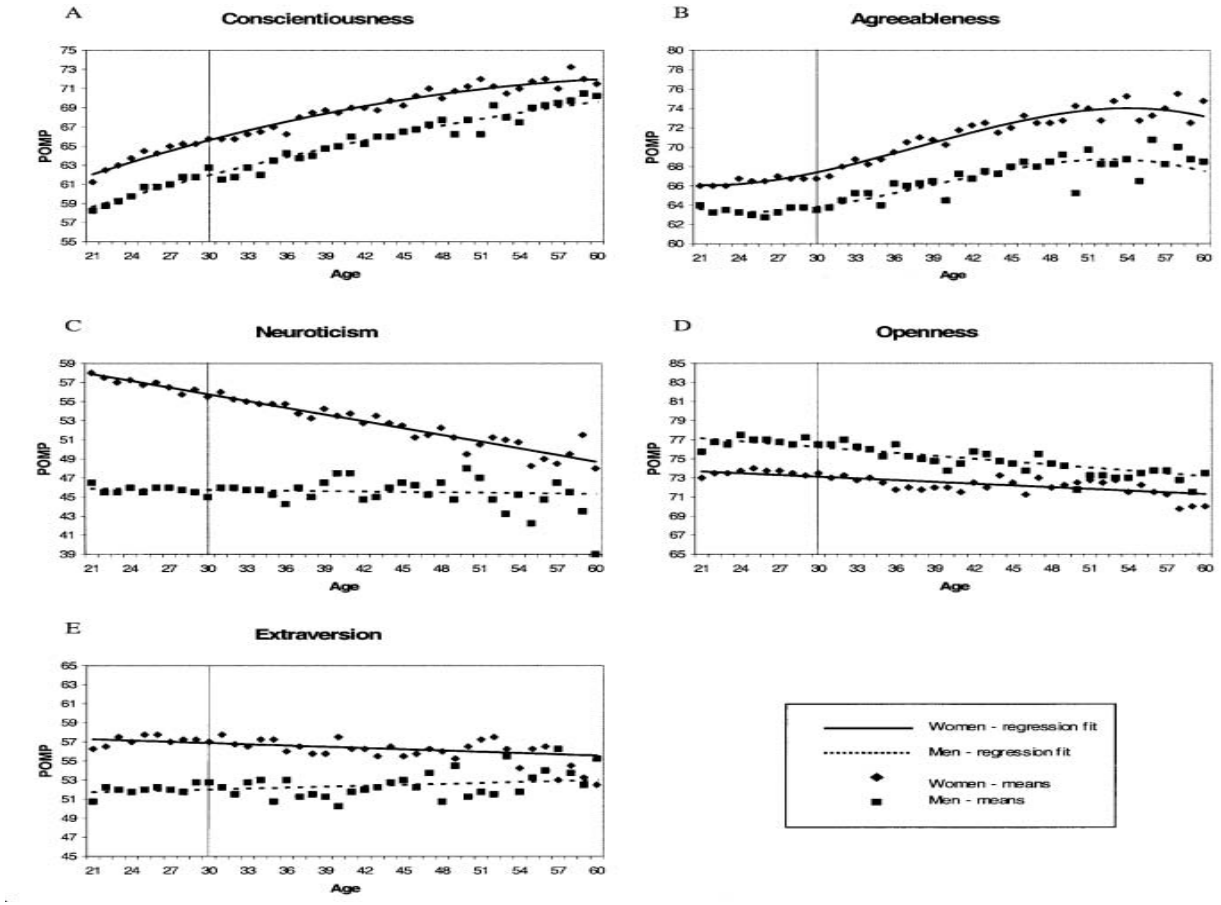
 age 50-70 - .74

Traits remain stable over time (and become more stable with time)



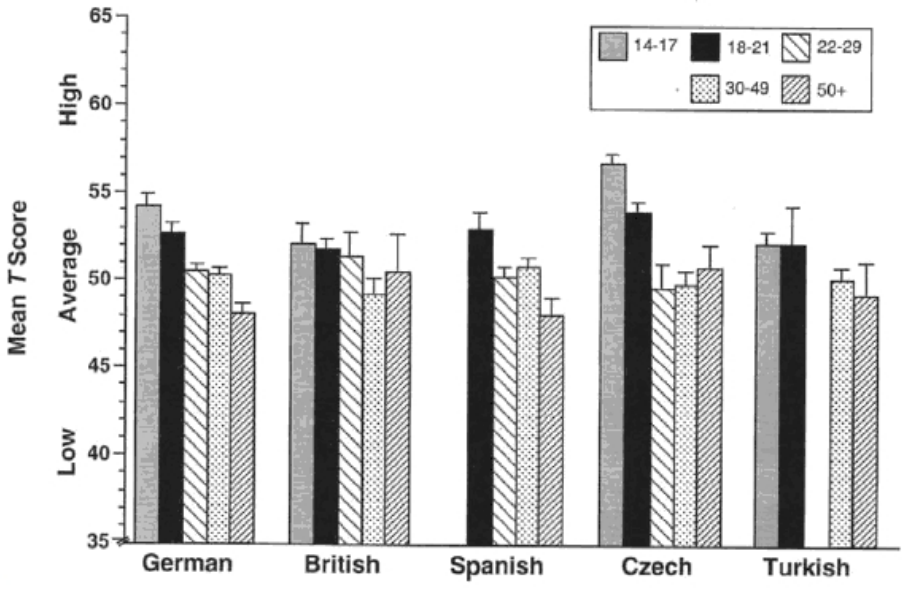
Courtesy of American Psychological Association. Used with permission. Source: Roberts, Brent W., and Wendy F. DelVecchio. "The Rank-Order Consistency of Personality Traits from Childhood to Old Age: A Quantitative Review of Longitudinal Studies." *Psychological Bulletin* 126, no. 1 (2000): 3-25.

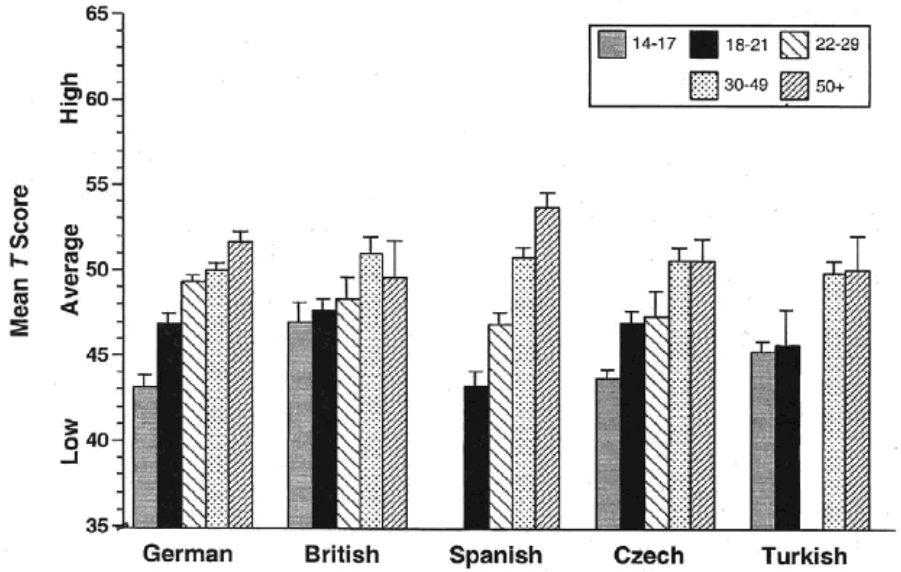
STABILITY OF PERSONALITY SCORES



Courtesy of American Psychological Association. Used with permission.

Average Big Five scores vary somewhat with age and sex. This graph depicts the mean score for men and women on each of the Big Five traits as a function of age. The results are derived from a sample of 132,515 adults, aged 21-60, who completed a version of the Big Five Personality Inventory that was posted on the Internet. Other studies, using more systematically chosen samples, have shown similar results. (Adapted from Srivastava & others, 2003, p. 1047)





Courtesy of American Psychological Association. Used with permission. Source: McCrae, R., et al. "Nature Over Nurture: Temperament, Personality, and Life Span Development." *Journal of Personality and Social Psychology* 78, no. 1 (2000): 173-86.

Measures of Personality

- high *neuroticism*
 - pay more attention to threat in environment
 - more stress when given surprise math test
 - higher divorce rate
 - more susceptible to depression and anxiety

Measures of Personality

- high *extraversion*
 - attend more parties, more popular
 - identified as leaders in college
 - live with and work with more people
 - less disturbed by sudden loud sounds or intense stimuli

Measures of Personality

- high *agreeableness*
 - more willing to lend money
 - higher school grades in childhood
 - fewer arrests as adults

Measures of Personality

- high *openness to experience*
 - more likely to major in humanities
 - change careers in midlife
 - perform better in job training programs
 - play a musical instrument

Measures of Personality

- **high *conscientiousness***
 - **more sexually faithful to spouses**
 - **higher job ratings**
 - **smoke less, drink less, drive more safely, live longer, less risk for Alzheimer's disease (89% less)**
 - **play a musical instrument**

Personality

NATURE (genetics)

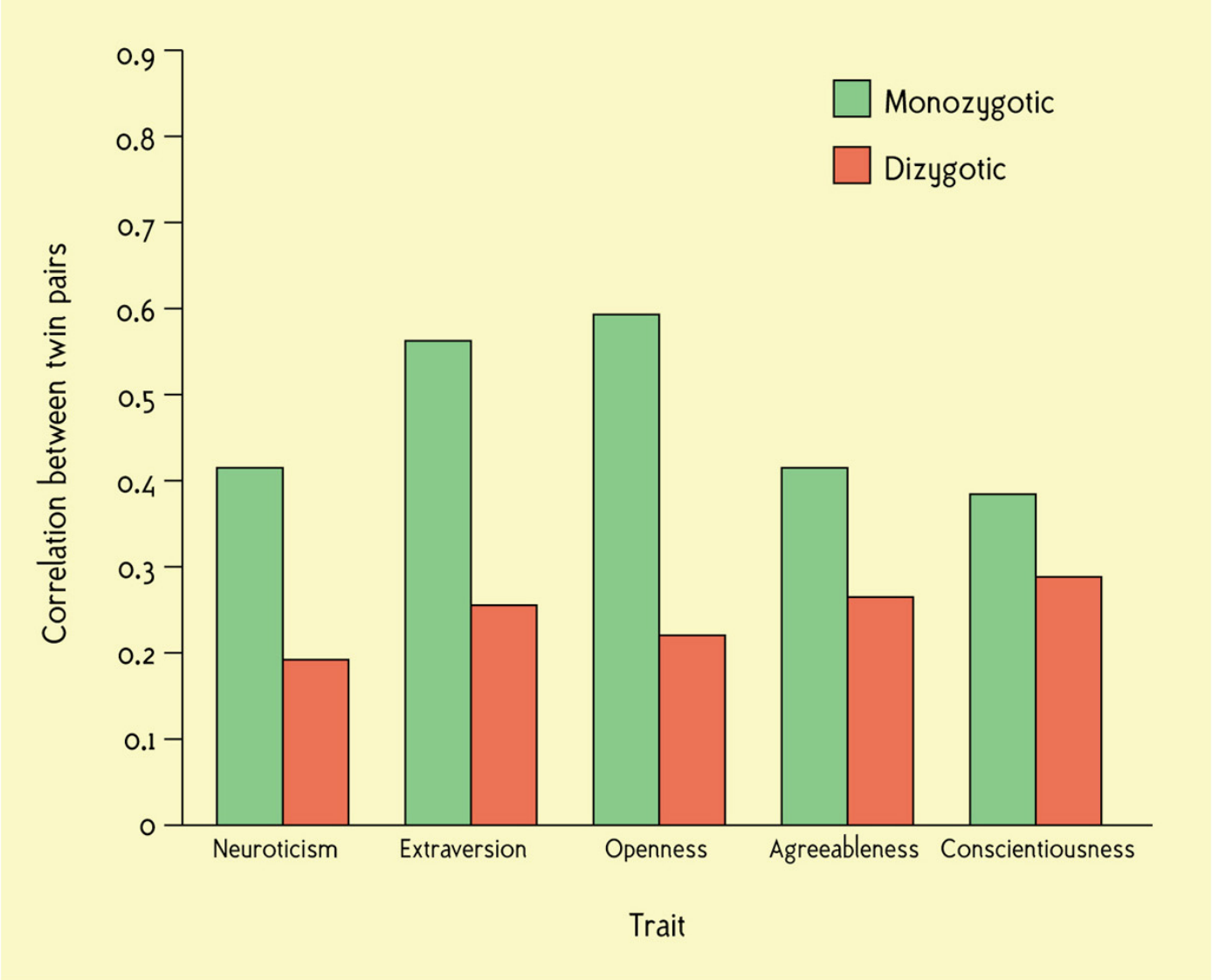
NURTURE (environment)

Twin Studies

monzygotic vs. dizygotic twins

reared together vs. reared apart

Personality is (partly) rooted in genetics: Twin studies



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Personality

GENETICS

Twin Studies-Specific Behaviors

time spent watching television

number of childhood accidents

tendency for marriage and divorce

religious attitudes

work/leisure interest (.50)

happiness (.50)

Personality

NATURE (genetics)

NURTURE (environment)

- **Twin Studies**
 - **monzygotic vs. dizygotic**
 - **reared together vs. reared apart (same)**

- **environmental factors - parents?**

PERSONALITY

- **identical twins reared apart - both very neat**

“My mother. When I was growing up she always kept the house perfectly ordered… I learned from her. What else could I do?”

“The reason is quite simple. I’m reacting to my mother, who was a complete slob.”

Personality

- **biological, non-twin siblings were far more similar to one another than adoptive siblings *(genetics?)***
- **for personality, children no more similar to adoptive sibling than two randomly selected children**
 - **family plays little or no role?**
 - **does personality fix the environment? sibling contrast? split-parent identification?**

PERSONALITY PSYCHOLOGY vs. SOCIAL PSYCHOLOGY

Why do we do things?

Who we are (personality)

Situation we are in (social context)

Personality

- **SITUATIONS**

Mischel & Peake - 1982 -

***conscientiousness* - 19 behaviors -**

making bed, attend class, complete assignments, neat class notes - consistent with situations, not across situations - *situationism*

Variation of Verbal Aggression Across Situations

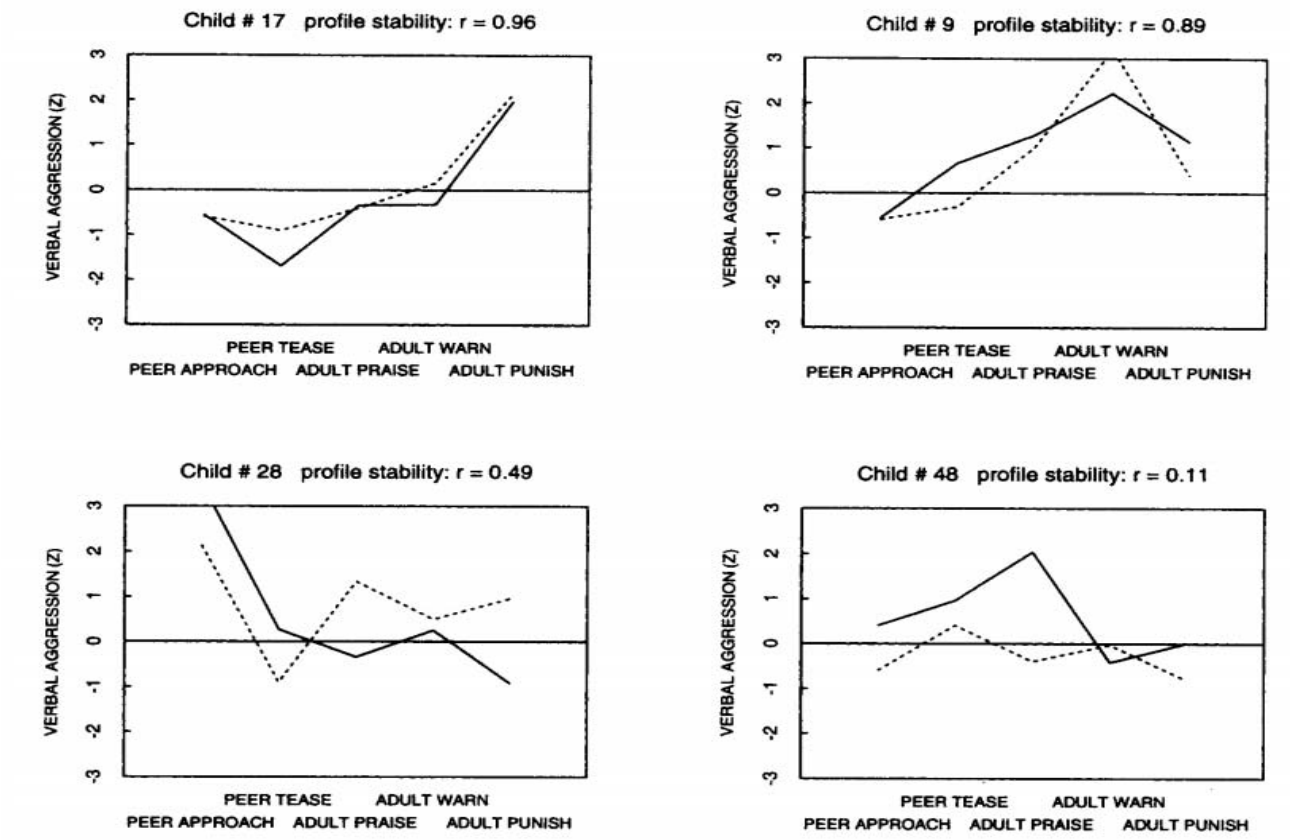


Figure 1. Illustrative intraindividual profiles of verbal aggression across five types of psychological situations. The two lines indicate the profiles based on two different, nonoverlapping samples of occasions in which the child encountered each type of psychological situation, shown as Time 1 (solid) and Time 2 (broken).

Situation-specific profiles of verbal aggression for two children. Shoda, Mischel, and Wright (1994) recorded various categories of behaviors among emotionally disturbed children in various social situations at a summer camp. Shown here are results concerning verbal aggressiveness for two children. Zero on the *y* axis represents the average aggressiveness for all the children observed. In overall verbal aggressiveness, these two children were similar, but they were very different with respect to the situations that elicited their aggression.

Courtesy of American Psychological Association. Used with permission. Source: Shoda, Y., et al. "Intraindividual Stability in the Organization and Patterning of Behavior: Incorporating Psychological Situations into the Idiographic Analysis of Personality." *Journal of Personality and Social Psychology* 67, no. 4 (1994): 674-87.

Personality

Temperament **- innate, biologically based propensity to engage in a certain style of behavior**

broader than traits - observable

- **activity level**
- **emotionality**
- **sociability**

Personality

Temperament - SHYNESS

- some babies (6 weeks) more reactive to environmental stimuli - fussy - 15-20%
- "high-reactive" or "inhibited" babies (vs. "low reactive") - more crying, distress, motor activity, faster heart rates, higher levels of cortisol
- faster heart rate in womb more likely to be reactive - sympathetic nervous system easily aroused, seek less arousing situation, inhibited

Personality

***Temperament* - SHYNESS**

- **Signs of inhibition at 2 months or 4 months predict shyness in later childhood and adulthood**
- **25% however are inhibited as infants but not shy in later childhood**

Personality

- over 1,000 children born in a year categorized as “well adjusted” or “inhibited” or “undercontrolled” at age 3
- 97% examined at age 21

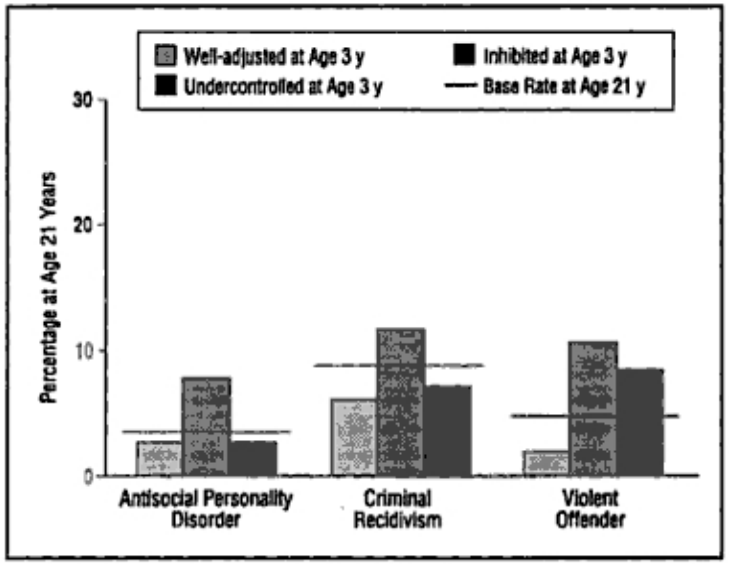


Figure 2. The association between behavior styles at age 3 years and adult criminal behavior.

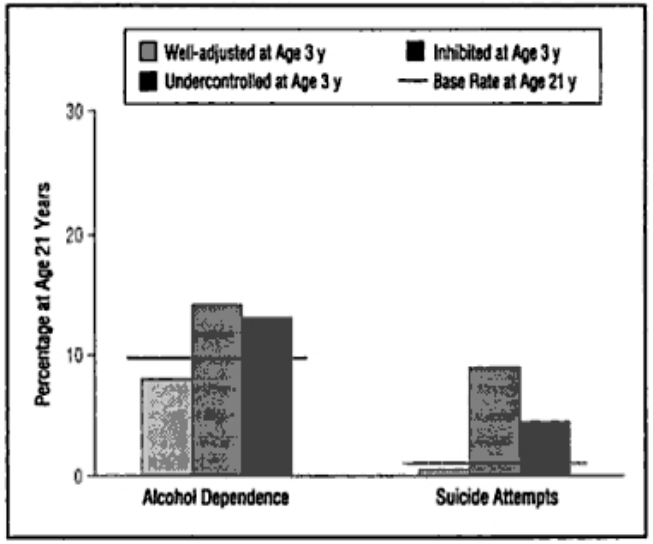


Figure 3. The association between behavior styles at age 3 years and adult alcohol dependence and suicide attempts.

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Personality

***Temperament* - SENSATION SEEKING**

- **pursuit of novel, high-stimulation situations**
- **diving, fast driving, drug/alcohol use, flame e-mails, punk music, driving accidents**
- **lower levels of MAO-B in blood, may allow dopamine to last longer at synapse**

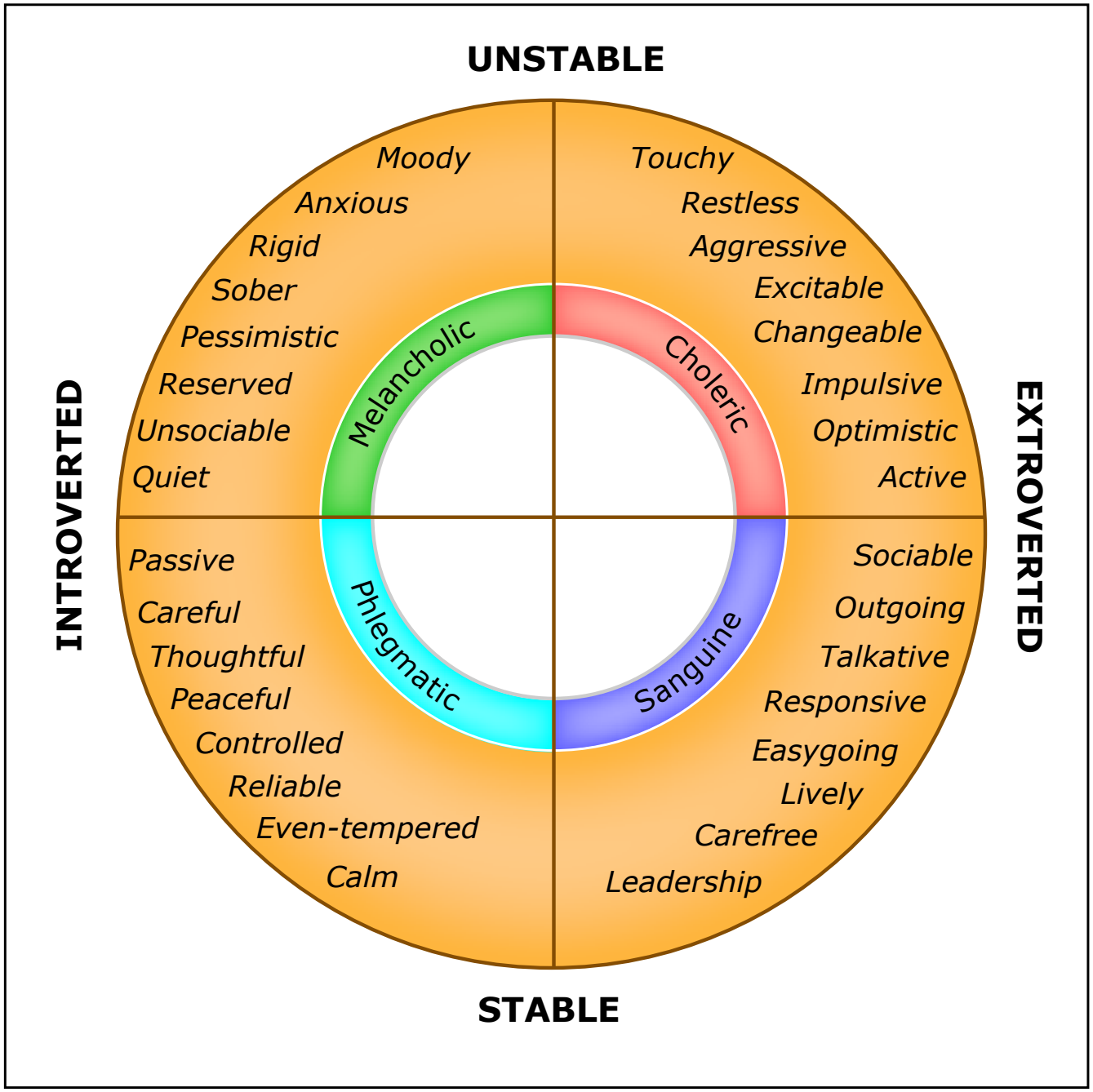


Image by MIT OpenCourseWare.

Personality

Eyesenck

Extraversion/Introversion

- **extraverts less easily aroused, seek stimulation**
- **introverts already aroused, seek quiet**
- **optimal level of arousal**
- **extraverts do better in a noisy settings**
- **introverts more sensitive to pain, salivate more to lemon juice**

Personality

- **SITUATION/PERSONALITY INTERACTIONS**

Introversion/extraversion

Time of day (am or pm)

Caffeine (or not)

Take a test - if introvert, drink coffee in pm

If extravert - drink coffee in am

Personality

Introversion/extraversion

Time of day

Caffeine - increases arousal

Introverts more aroused in am, less in pm

Extraverts more aroused in pm, less in am

Take a test - if introvert, drink coffee in pm

If extravert - drink coffee in am

The Yerkes-Dodson Law

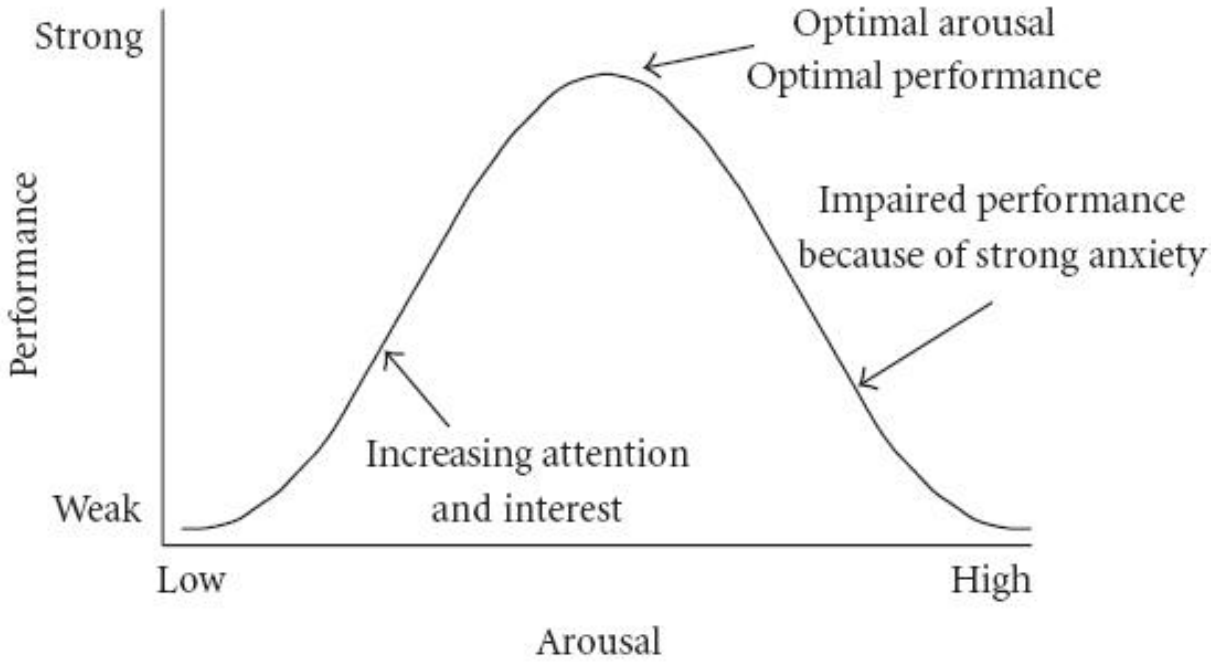
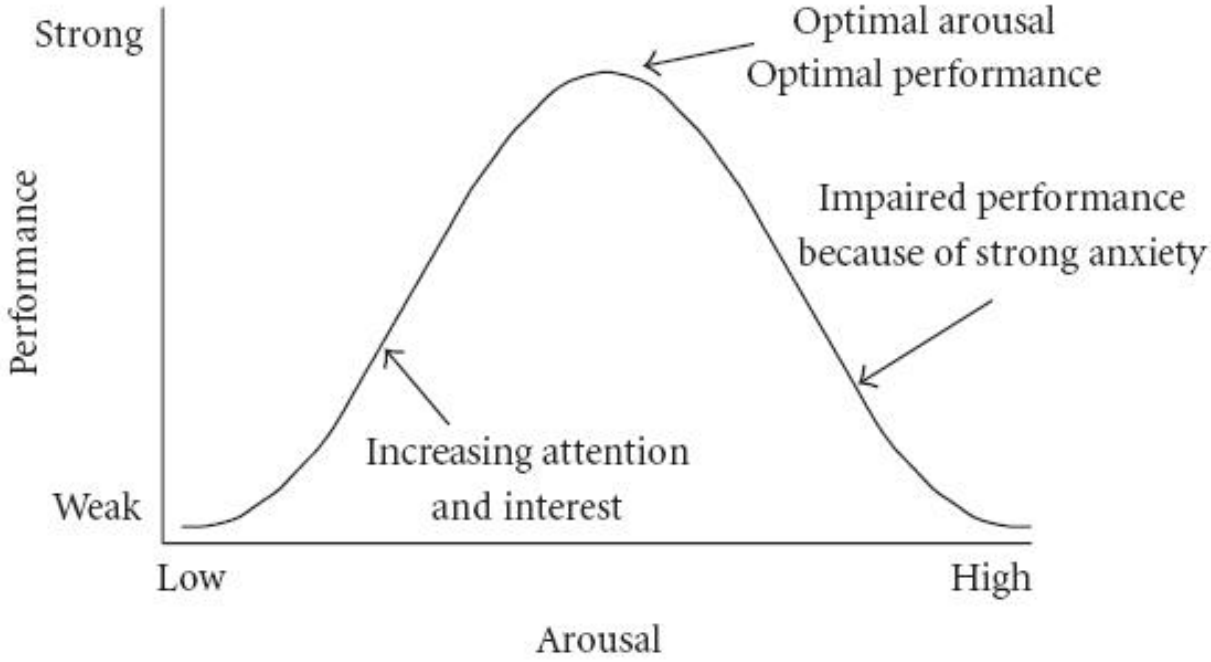


Image is Figure 3 from Diamond D. M., et al. "The Temporal Dynamics Model of Emotional Memory Processing: A Synthesis on the Neurobiological Basis of Stress-Induced Amnesia, Flashbulb and Traumatic Memories, and the Yerkes-Dodson Law." *Neural Plasticity* 33 (2007). dx.doi.org/10.1155/2007/60803.

The Yerkes-Dodson Law



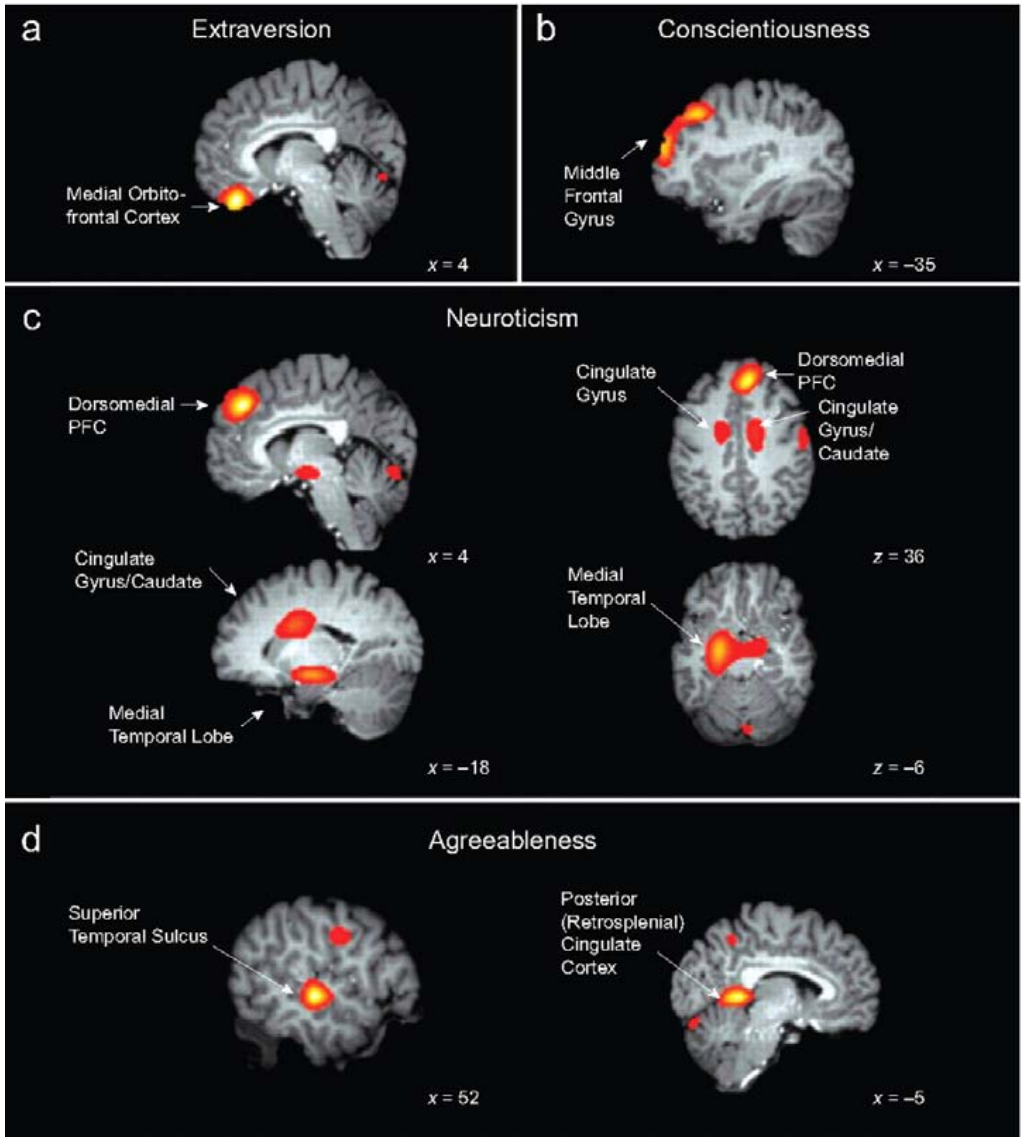
extravert **roverts**

Image is Figure 3 from Diamond D. M., et al. "The Temporal Dynamics Model of Emotional Memory Processing: A Synthesis on the Neurobiological Basis of Stress-Induced Amnesia, Flashbulb and Traumatic Memories, and the Yerkes-Dodson Law." *Neural Plasticity* 33 (2007). dx.doi.org/10.1155/2007/60803.

Take a test - if introvert, drink coffee in pm

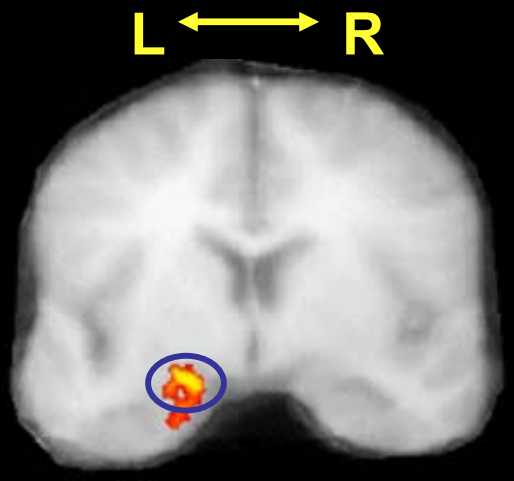
If extravert - drink coffee in am

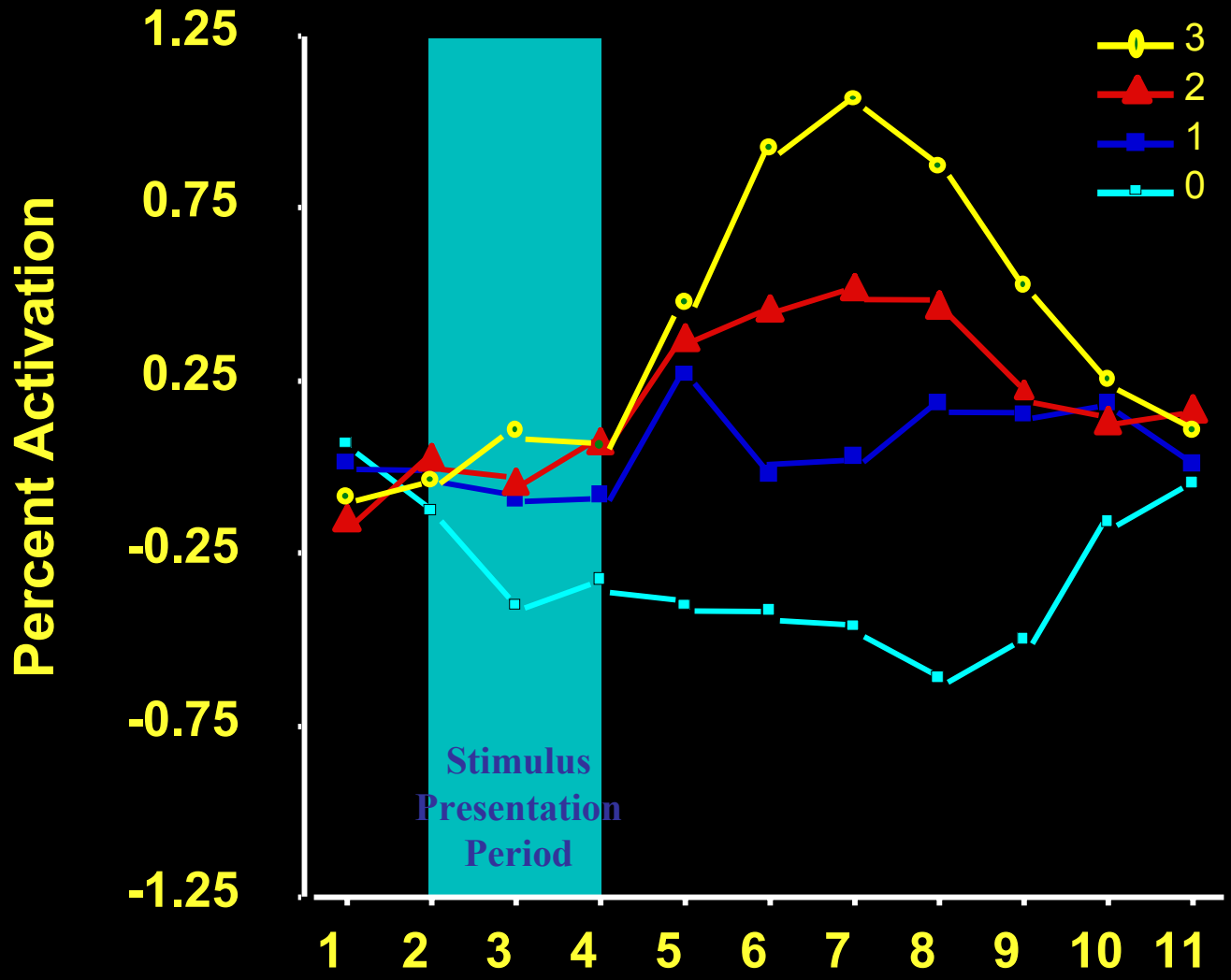
Brain regions in which local volume was significantly associated with (a) Extraversion, (b) Conscientiousness, (c) Neuroticism, and (d) Agreeableness



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Emotional Experience





Images from the International Affective Picture System removed due to copyright restrictions.

Extraversion as a Fundamental Dimension Of Human Personality

Introvert	Extravert
reserved	sociable
quiet	talkative
aloof	affectionate
task-oriented	person-oriented
serious	fun-loving

- Report more Positive Experiences
- Susceptible to Positive Mood Induction

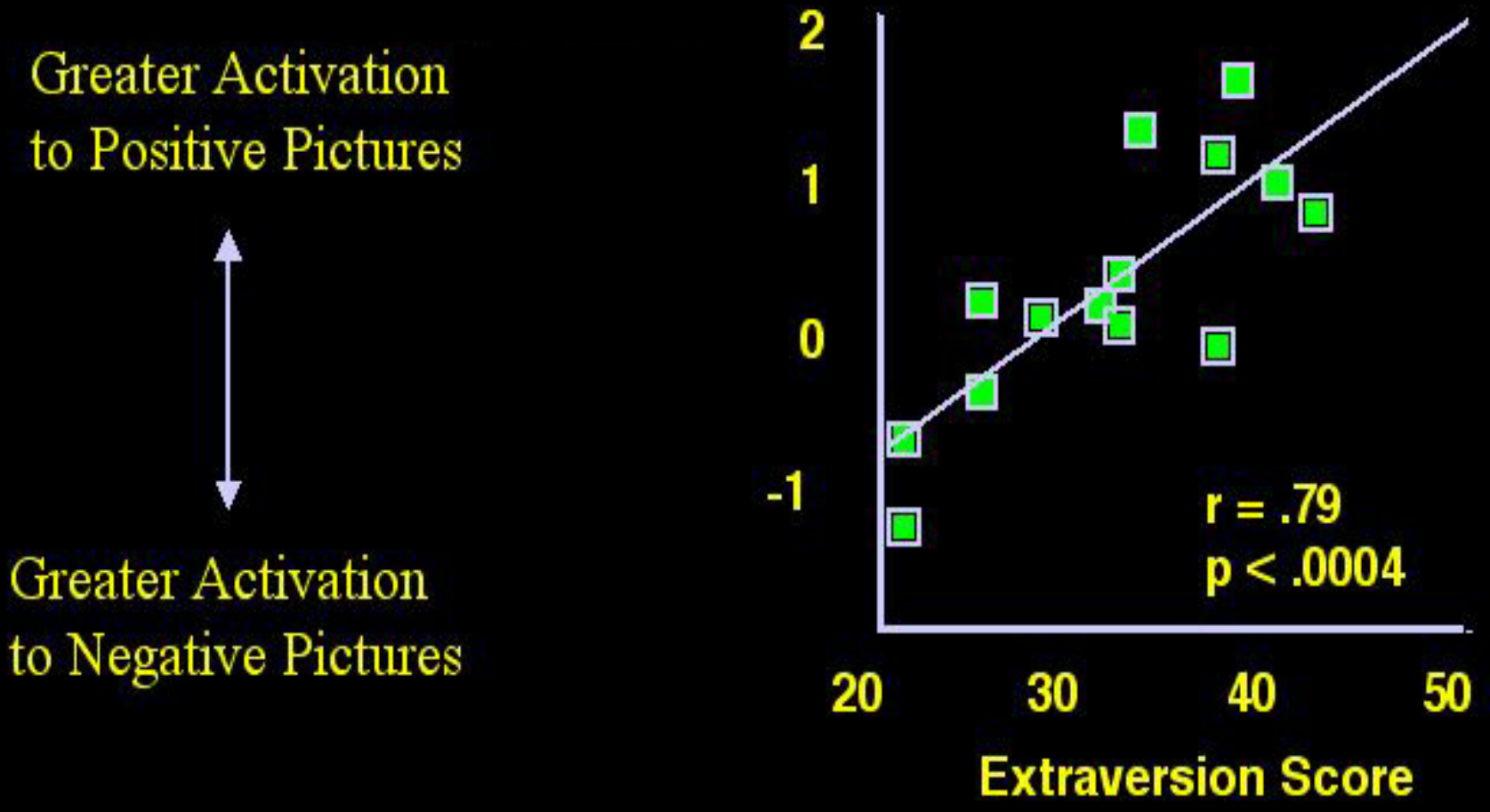
Experimental Design

1 scan = 5 cycles

1 cycle = 4 negative, 4 positive pictures

1 picture displayed for 7.5 seconds each

Amygdala Reactivity to Positive Pictures Correlates with Extraversion



Courtesy of American Psychological Association. Used with permission. Source: Canli, T., et al. "An fMRI Study of Personality Influences on Brain Reactivity to Emotional Stimuli." *Behavioral Neuroscience* 115, no. 1 (2001): 33-42.

Experimental Design



... 10 x

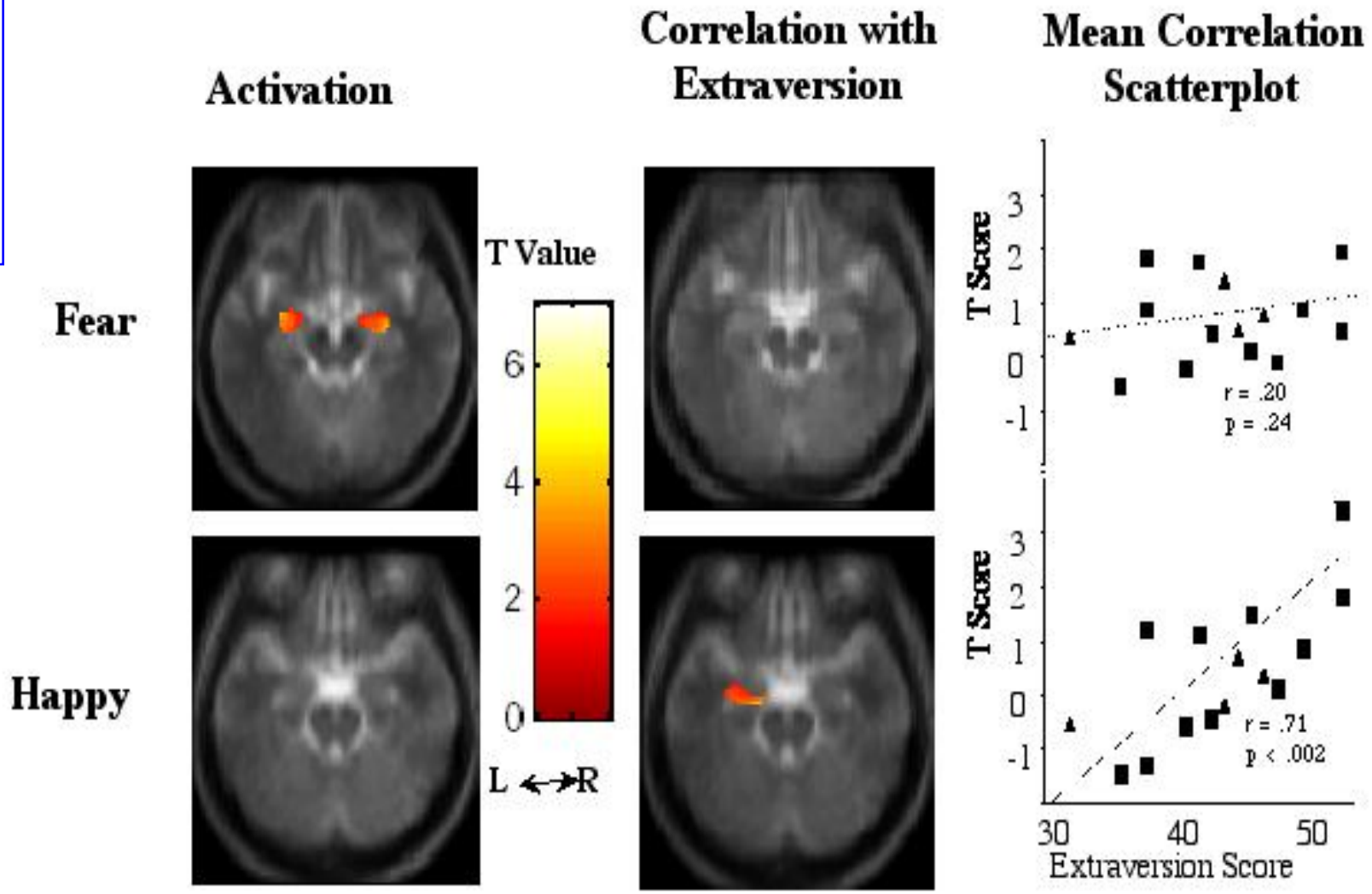
Fear | Neutral | Sad | Scrambled | Angry | Happy ... 3 x

1 Scan = 3 Cycles

1 Cycle = 6 Emotion Conditions, 10pics

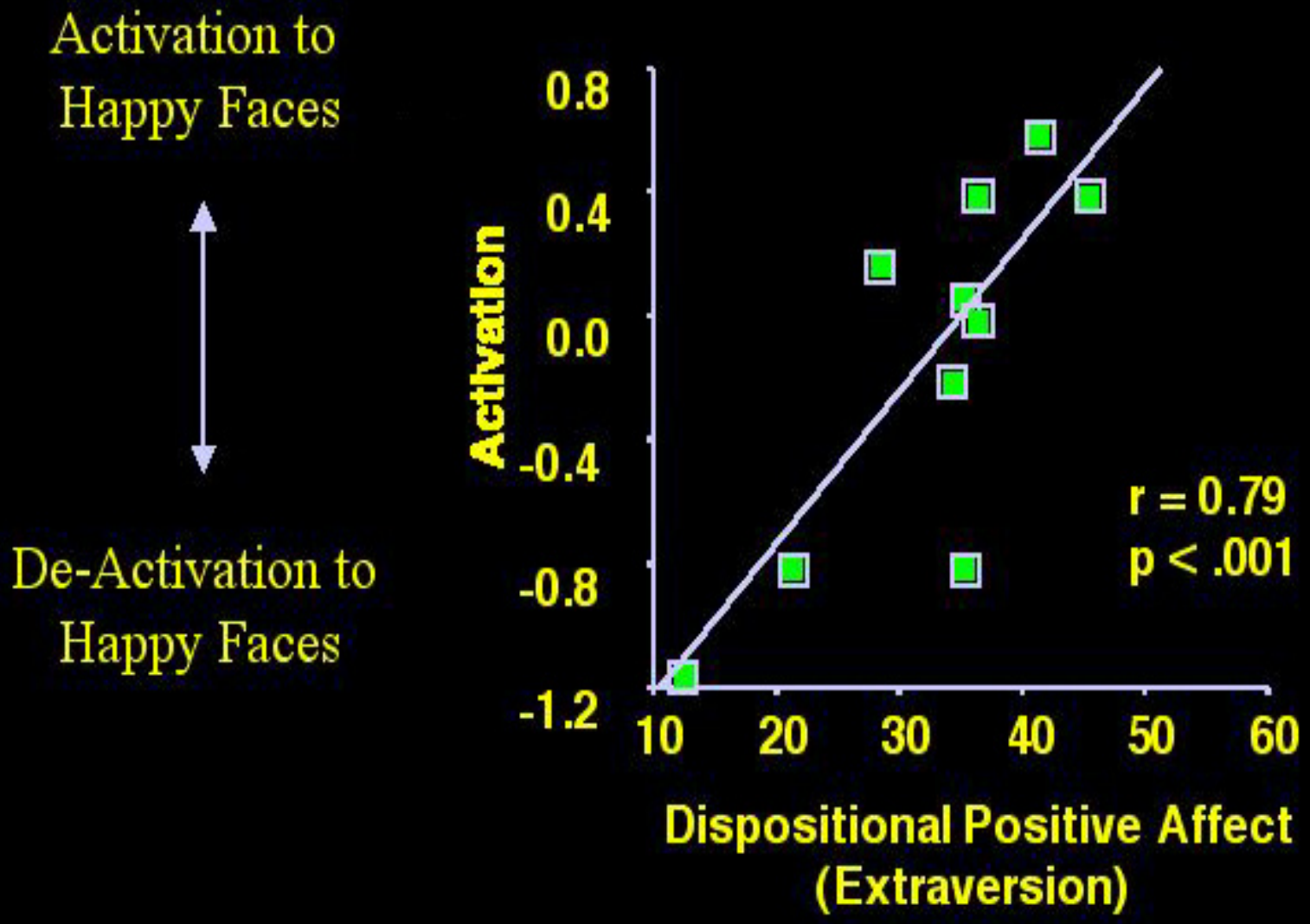
1 Picture displayed for 3 sec each

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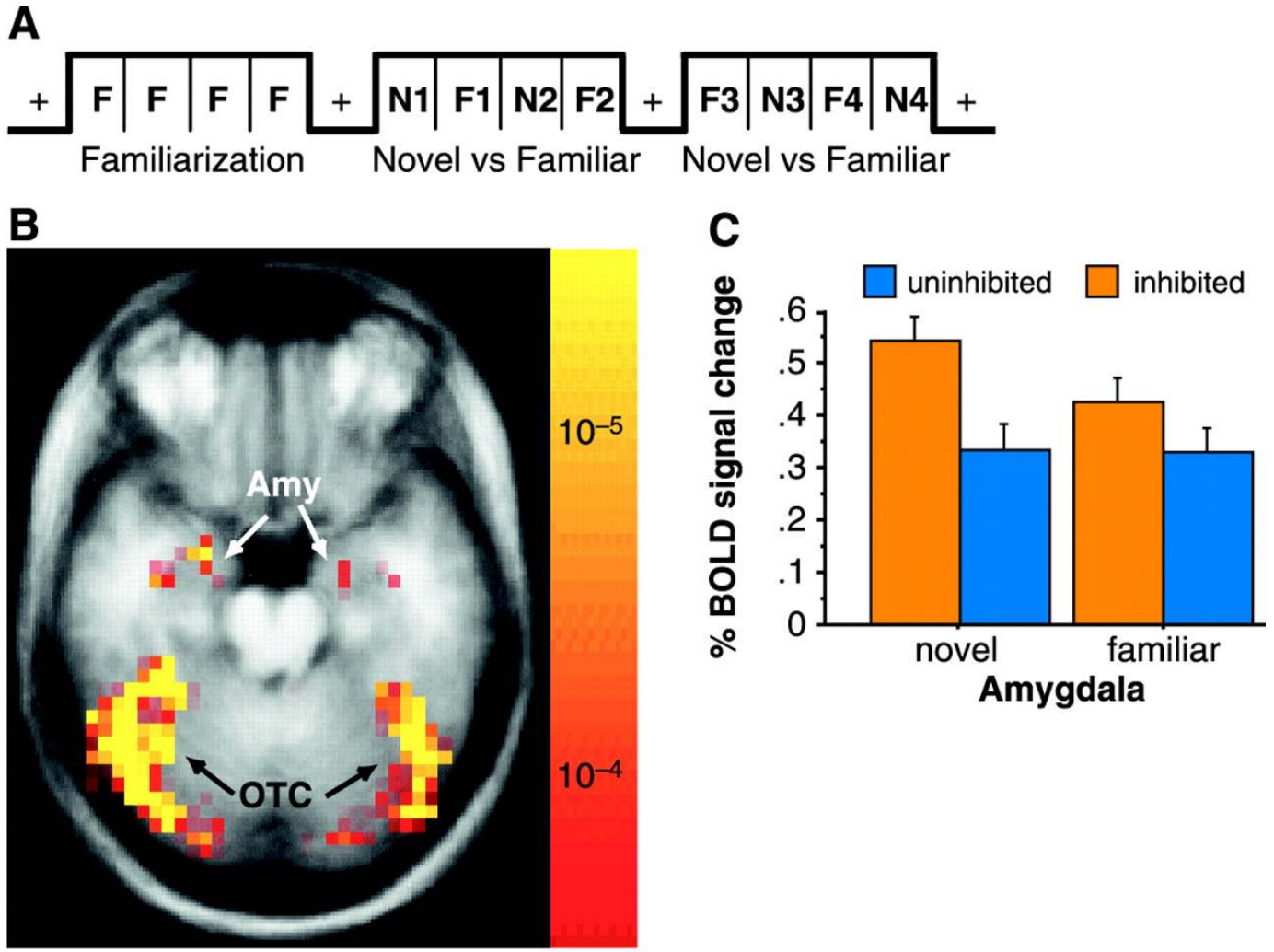
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Amygdala Reactivity to Happy Faces Correlates with Extraversion



Courtesy of American Psychological Association. Used with permission. Source: Canli, T., et al. "An fMRI Study of Personality Influences on Brain Reactivity to Emotional Stimuli." *Behavioral Neuroscience* 115, no. 1 (2001): 33-42.

Inhibited and uninhibited infants "grow up": Adult amygdalar response to novelty



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Spielberger State and Trait Anxiety

Example

The **S-Anxiety scale** consists of twenty statements that evaluate how respondents feel "right now, at this moment."

1	2	3	4
Not At All	Somewhat	Moderately So	Very Much So

A.	I feel at ease	1	2	3	4
B.	I feel upset	1	2	3	4

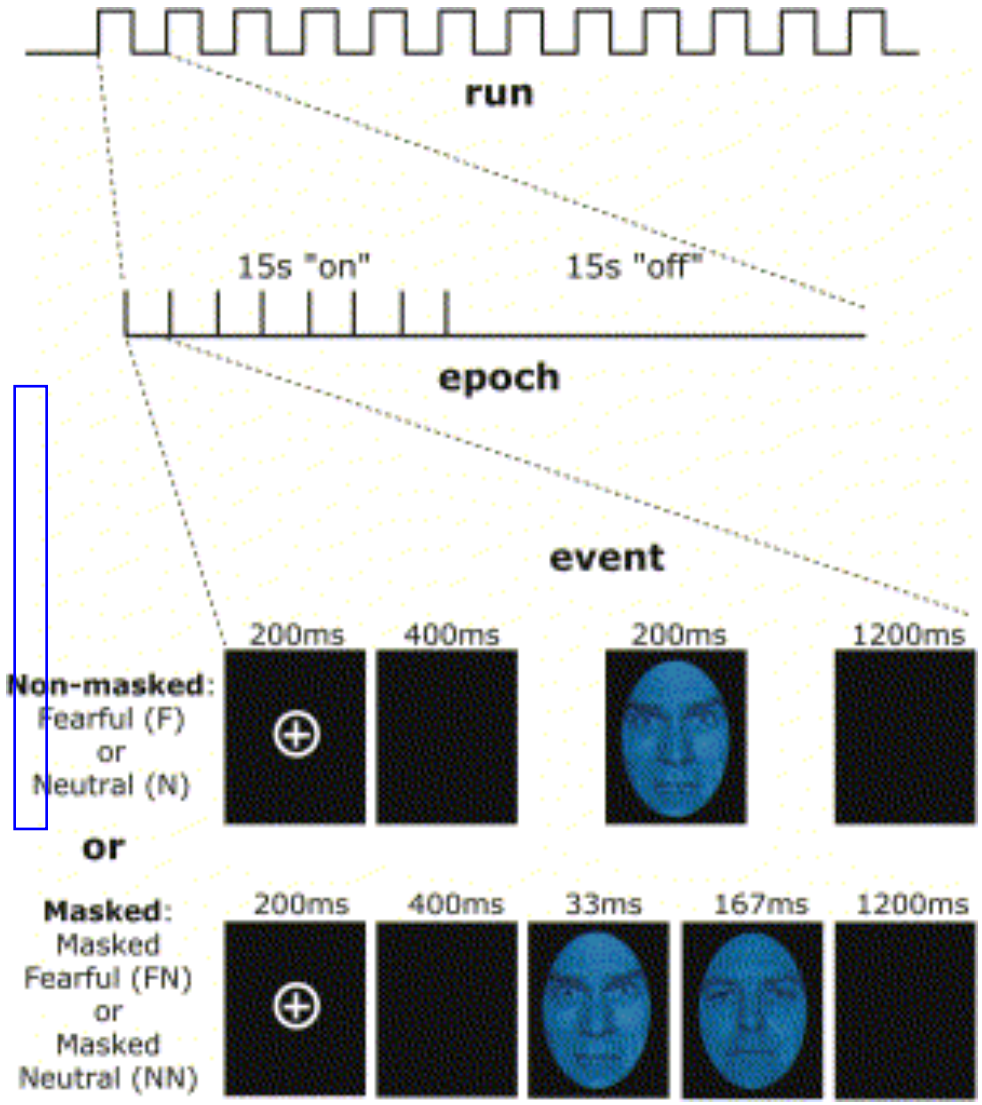
The **T-Anxiety** scale consists of twenty statements that assess how respondents feel "generally."

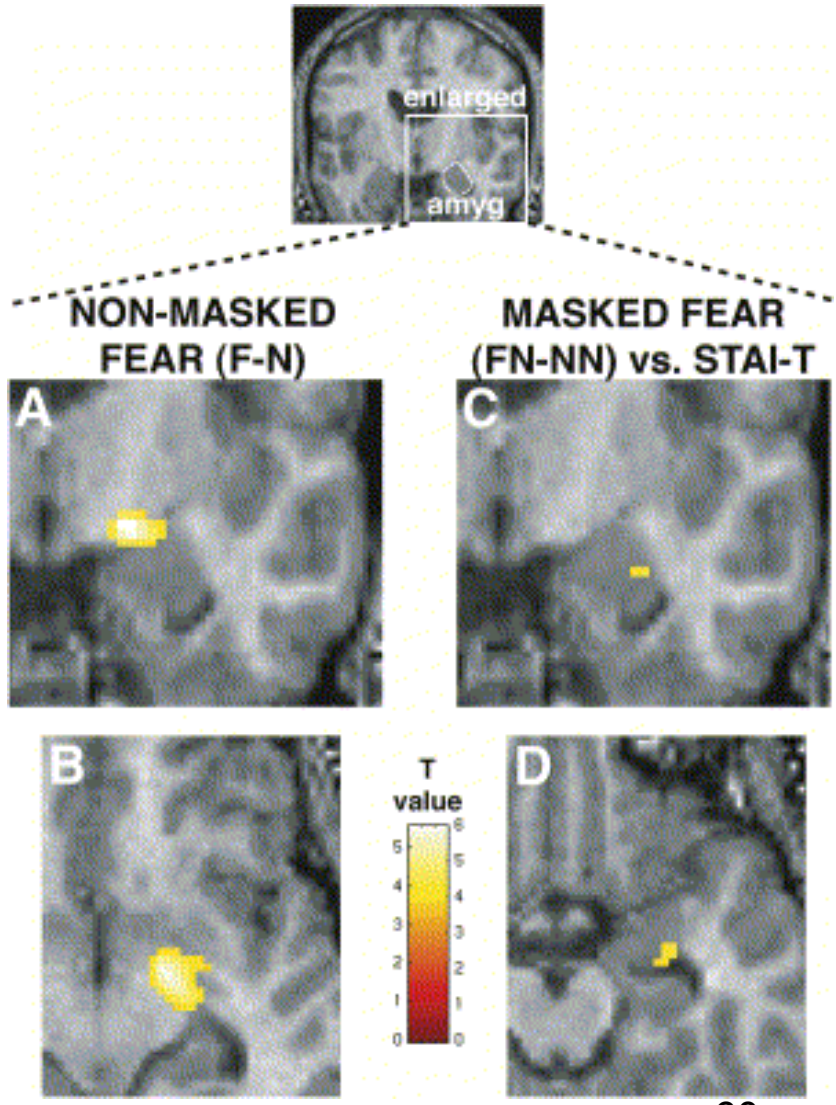
1	2	3	4
Almost Never	Sometimes	Often	Almost Always

A.	I am a steady person	1	2	3	4
B.	I lack self-confidence	1	2	3	4

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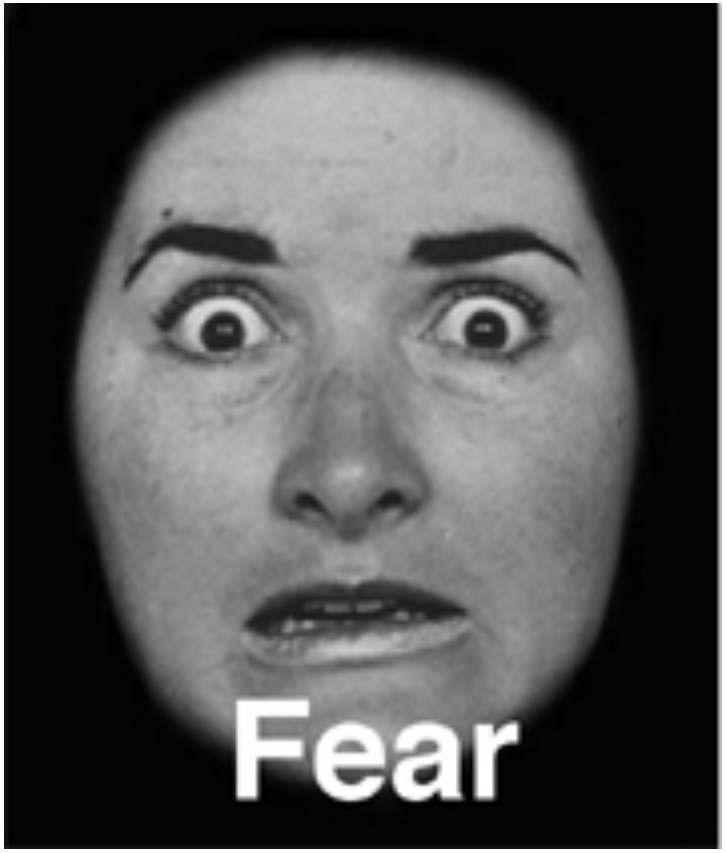
Individual differences in trait anxiety predict the response of the basolateral amygdala to unconsciously processed fearful faces





Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission. Source: Etkin, A., et al. "Individual Differences in Trait Anxiety Predict the Response of the Basolateral Amygdala to Unconsciously Processed Fearful Face." *Neuron* 44, no. 6 (2004): 1043-55.

Human amygdala: Impaired recognition of fear



- Intact face recognition
- Impairment selective for fear

Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience.
Source: Susskind, J., et al. "Expressing Fear Enhances Sensory Acquisition."
Nature Neuroscience 11, no. 7 (2008): 843-50. © 2008.

Genetics & fMRI

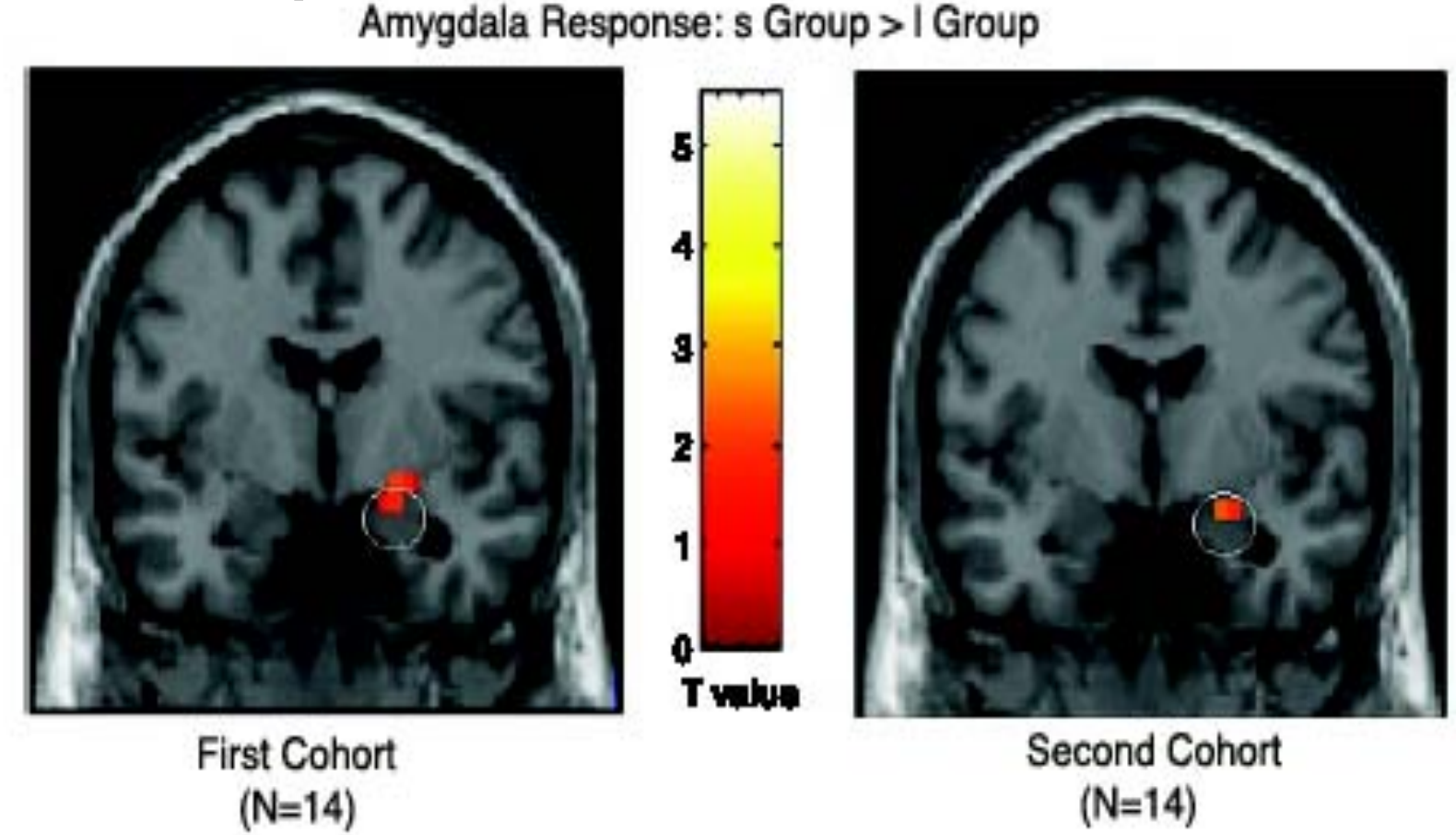
SNPs - single nucleotide polymorphisms

- **DNA sequence variation of a single nucleotide**
 adenine (A), thymine (T), cytosine (C), guanine (G)
- **at least 1% of the population**
- **make up 90% of human genetic variation**
- **constant from generation to generation**

Genetic Variation in Amygdala Response

(Hariri et al., 2002)

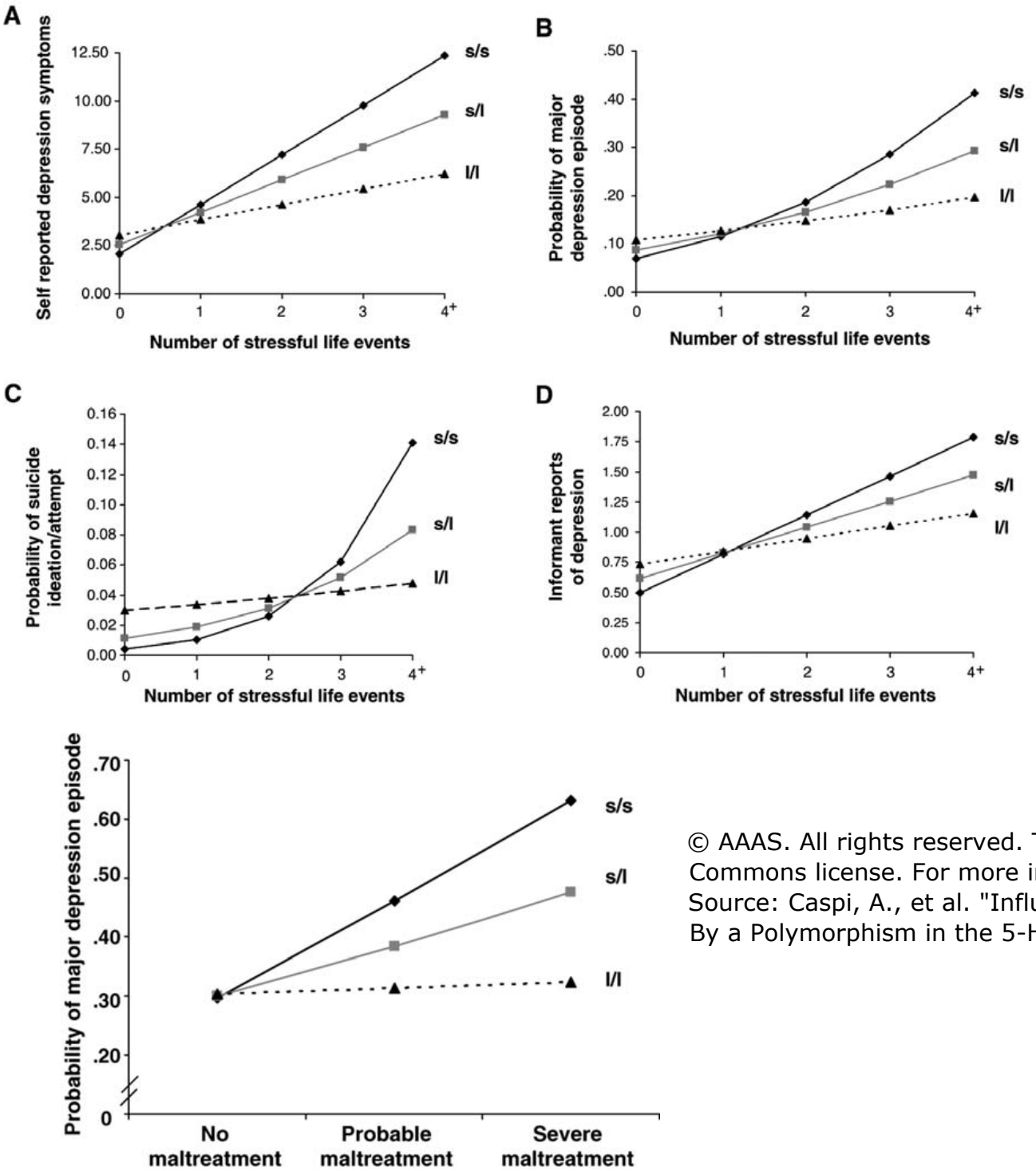
- Short vs. long allele in variable repeat sequence of promoter region of serotonin transport gene
- Short allele associated with anxiety traits
- Greater response to fearful faces in short allele



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GENE X EXPERIENCE INTERACTION

- Caspi, 2003
- polymorphism of 5-HTT gene
- stressful life events (ages 21-26; job, money, housing, health, relationships)
- childhood maltreatment (ages 3-11)
- short version of allele - more depression and suicidality in response to stressful events than those homozygous for long allele (not always replicated)



Alleles

s/s

s/l

l/l

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Source: Caspi, A., et al. "Influence of Life Stress on Depression: Moderation By a Polymorphism in the 5-HTT Gene." *Science* 301, no. 5631 (2003): 386-89.

EXAM 2

- 70 points
- range 68-34
- mean = 56.5

Rough grade distribution

A = 68 - 57

B = 56 - 50

C = 49 - 34

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CHILD Development

John Gabrieli - 9.00

Neotony

- **baby faces are appealing – round head, forehead protruding forward rather than sloping back, large eyes, small jawbone**



Photo courtesy of Duncan H on Flickr. CC-BY-NC-SA.

Neotony

- **“baby-faced” adults perceived as more naïve, honest, helpless, kind, warm, and also more likely to be found innocent in cases of intentional wrongdoing (no difference for negligence), less likely to receive votes**



Photo of Leonardo DiCaprio courtesy of Ninah Morandini on Flickr.



Photo of Brad Pitt courtesy of ewanjudecolinchristian on Flickr. CC-BY.

Nature/Nurture

- **Nature/Nativism/Rationalism**
- **some knowledge is innate (Plato, Descartes, Kant)**
- **Nurture/Empiricism**
- **“Nothing is in the intellect which was not first in the senses.” (Aristotle, & Locke, Berkeley)**

Nature/Nurture

- **babies appear to be”blank slates”**
- **“Give me a dozen healthy infants, well formed and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to become any type of specialist I might select - doctor, lawyer, artist, merchant-chief and yes, even beggerman and thief…”**
- ***Watson, 1878-1958, Behaviorism***



Imitation in neonates. **In a remarkable study, investigators sat face-to-face with infants just a few days old. When the investigators stuck out their tongues, the infants did the same. When the investigators opened their mouths wide, or pursed their lips, the infants did too. The capacity for imitation, it seems, is in place even for very young babies!**

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READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

- **if infants prefer to look at one thing more than another**
- **preference**
- **discrimination**

READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

- **habituation/familiarization**
- **infant exposed to stimulus until looking time drops 50% or some preset criterion - change stimulus, look for recovery of interest**

READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

what happens when stimulus is changed?





old **new**

Photos courtesy of Chris Nixon on Flickr.

Infant Explorers (18-24 months)

- ***infants look selectively at novel objects***
 - *** investigate what is to be learned**
 - **- even at 1 day for two checkerboards with different sizes squares from trial to trial (secs)**

Infant Explorers (18-24 months)

- ***infants seek to control their environment***

 *** 20-month olds prefer mobile that responds to their bodily moments than motor-driven**

 *** 2-month olds – learned to start/stop video of *Sesame Street* by pulling string tied to wrist – showed facial expression of anger when device was disconnected – 4-and 5-month olds remained angry/sad even when video came on as often but without their control (they like the control over the video)**

Infant Explorers (18-24 months)

- ***infants explore increasingly with hands and eyes together***
 - *** first 3-4 months, explore with mouths**
 - *** by 5-6 months, explore with hands and eyes across cultures**
- ***infants use social cues to guide exploration***
 - *** 6-month olds roll or pound ball depending on what mother did**
 - *** follow eyes of person (joint attention), but not if eyes are closed, covered (not head direction)**
 - *** helps to learn language – infants who follow gaze better learn language faster**
 - *** 12-month olds will cross visual cliff if mother smiles, not if mother has fearful expression, avoid new toy if mother exhibits disgust, otherwise played with it**

Jean Piaget

At the beginning there was chaos….

Jean Piaget (1986-1980) offered
a theory that tried to reconcile Nativism & Empiricism

a frame-work for
understanding & charting child development

Jean Piaget

- **child prodigy**
- **trained in biology (mollusks)**
- **early concern whether categories were “out there” or in the mind**
- **brief flirtation with poetry**
- **worked with Binet on intelligence testing**
- **became more interested in patterns of errors than successes**

Jean Piaget

- ***Assimilation***

incorporate new knowledge into existing cognitive structure

- ***Adaptation***

change cognitive structures to accommodate new evidence

Piagetian Stages

Stage	*Age*	*Mental Life*
Sensorimotor	**0-2**	**perception & physical actions**
Pre-Operational	**2-7**	**egocentric perspective; early symbolic language; poor differentiation of fantasy and reality**
Concrete	**7-11**	**organized logical thought, concrete but not abstract problem solving**
Formal Operational	**11-adult**	**less concrete thinking, generate and test multiple hypotheses, consider physically impossible hypotheticals**
Adult	**adult**	**no new cognitive skills, knowledge gains**

Piaget Stages
Sensorimotor (birth - 2 years)

- **fleeting, disconnected sensory impressions & motor reactions - intelligence centered on action; thought = action**
- **no distinction between stable objects & transient events, no distinction between "me" and "not me"**
- **stage ends with beginning of abstract representations, symbolic thought**



Photo courtesy of paul goyette on Flickr.

Sensorimotor Object Permanence

- **18-24 months, beginning of abstract, representational thought - respond to mental representation of object, not the percept of the object**

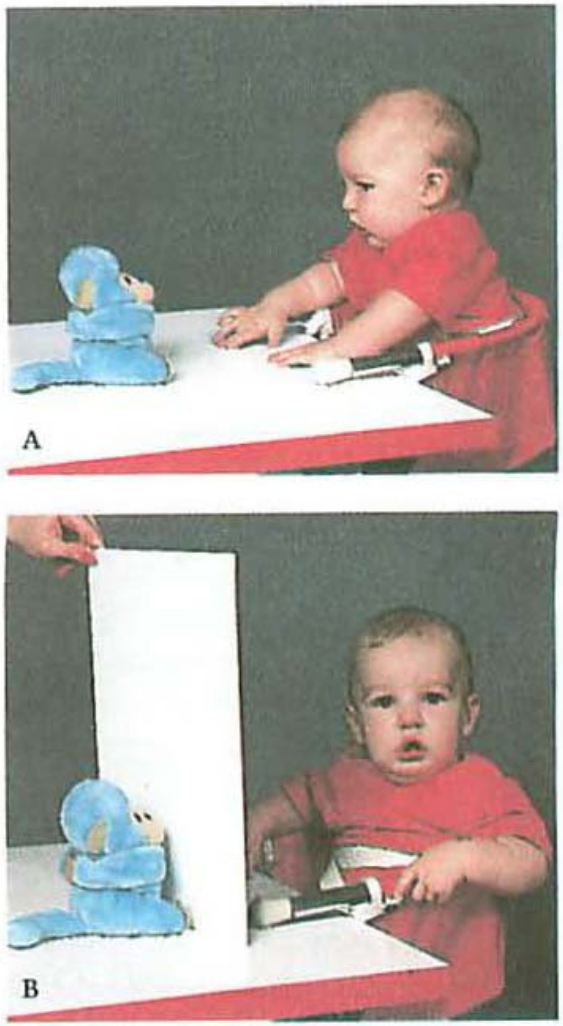
Sensorimotor Object Permanence

- **see rattle - rattle there - look away or occlude, rattle no longer exists - "out of sight, out of existence" - not aware that an object exists independent of our sensorimotor interaction with that object**
- **until 8 months, infant does not search for hidden toy - starts to around 8 months**
- **hide toy under blanket (location A), child searches there - do that several times - slowly, in view of child, place toy under other blanket (location B) - child still searches under location A - *"A-not-B effect"* - not searching for "toy", but rather for the "toy-that-I-find-on-the-right"**
- **appearance vs. principles (ideas)**



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OBJECT PERMANENCE



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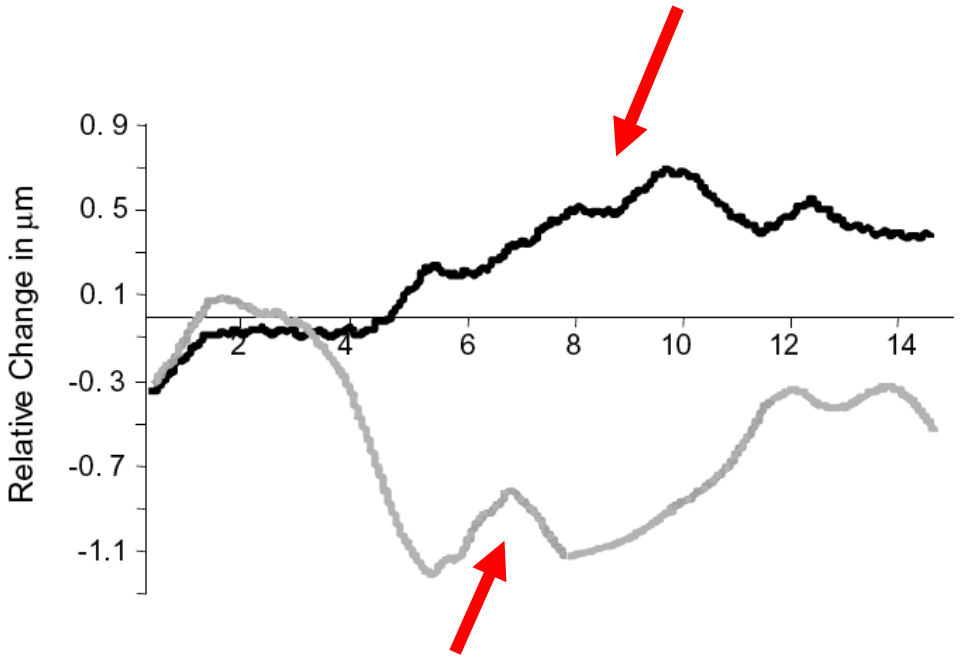
Object permanence (A) A six-month-old looks intently at a toy. (B) But when the toy is hidden from view, the infant does not search for it. According to Piaget, this is because the infant does not as yet have the concept of object permanence.

Sensorimotor
Object permanence

Object permanence & Frontal Lobe maturation
functional Near Infrared Spectrocscoy (Baird et al.)



Blood flow to frontal lobe
when child reaches for hidden object
Object permanence achieved



Blood flow to frontal lobe
when child fails to reaches for hidden object
before object permanence

Courtesy of Elsevier. Used with permission.

Object Permanence 2

Video “Object Permanence 2” removed due to copyright restrictions.

Infant Development

What do infants know about events & objects?

Renee Baillergon's Magical Events

Method: Preferential looking

Long looking time =
infant perceives "novelty"

Piaget Stages
Preoperational (2-7)

Capabilities

- **pretend play**
- **symbolic representations**
- **imitation**

Limitations

- **representing operations that respect logical transformations (perspective taking, part-whole relations, conservation, causal relations)**

Preoperational Stage Conservation of Liquid Quantity

Which glass has more water?

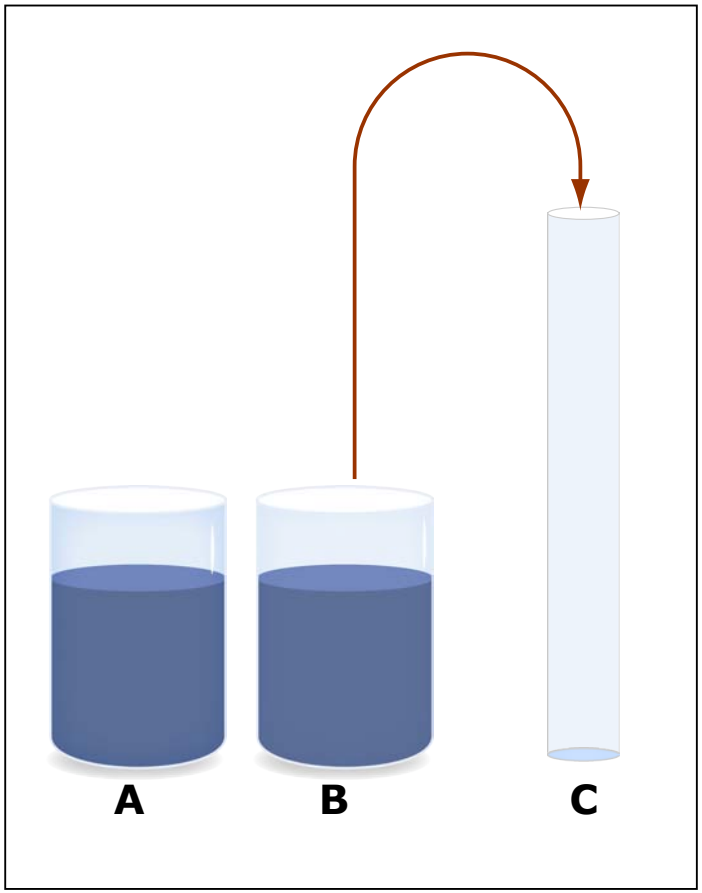


Image by MIT OpenCourseWare.

Conservacoes

Video “Piaget – Conservacoes” removed due to copyright restrictions.

CONSERVATION OF LIQUID QUANTITY





Conservation of liquid quantity. **(A) A child is asked by the experimenter, "Do we both have the same amount of juice to drink?" the child says yes. (B) The experimenter pours the juice from one of the beakers into a new, wider beaker. When now asked, "Which glass has more juice?" the child points to the thinner one.**

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CONSERVATION OF MASS & NUMBER



Conservation of mass: Preschoolers also fail to conserve mass. This child is shown two clay balls which he adjusts until he is satisfied that there is the same amount of clay in both. The experimenter takes one of the balls and rolls it into a "hot dog." When now asked which has more clay, the child points to the hot dog.



Conservation of number: When the two rows of coins are evenly spaced, the child correctly says that both rows contain the same number of coins. When one row is spaced more widely, the child says that it has more coins.

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Preoperational Stage Taking Perspectives

- difficulty taking another person's perspective
- think their thoughts and perceptions are transparent to others

Beyond Piaget

Theory of Mind

Ability to understand another person's mental state (another person's beliefs, desires, feelings)

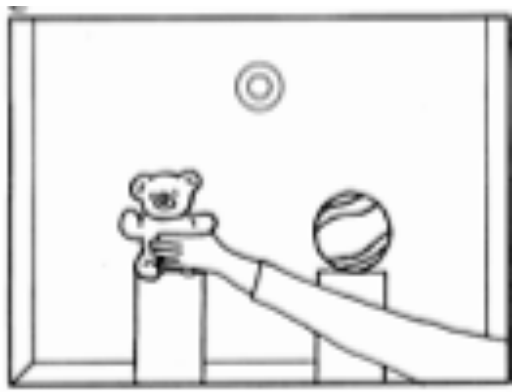
Intro to Theory of Mind

Body Motions -> Reaching actions at 6 months (versus 3 months)

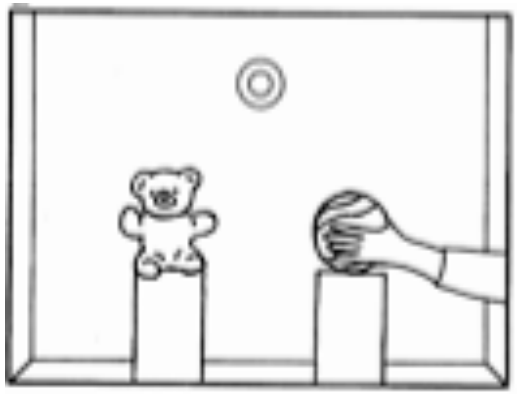
"Habituation"



"Test"



"Same Action"



"Same Object"

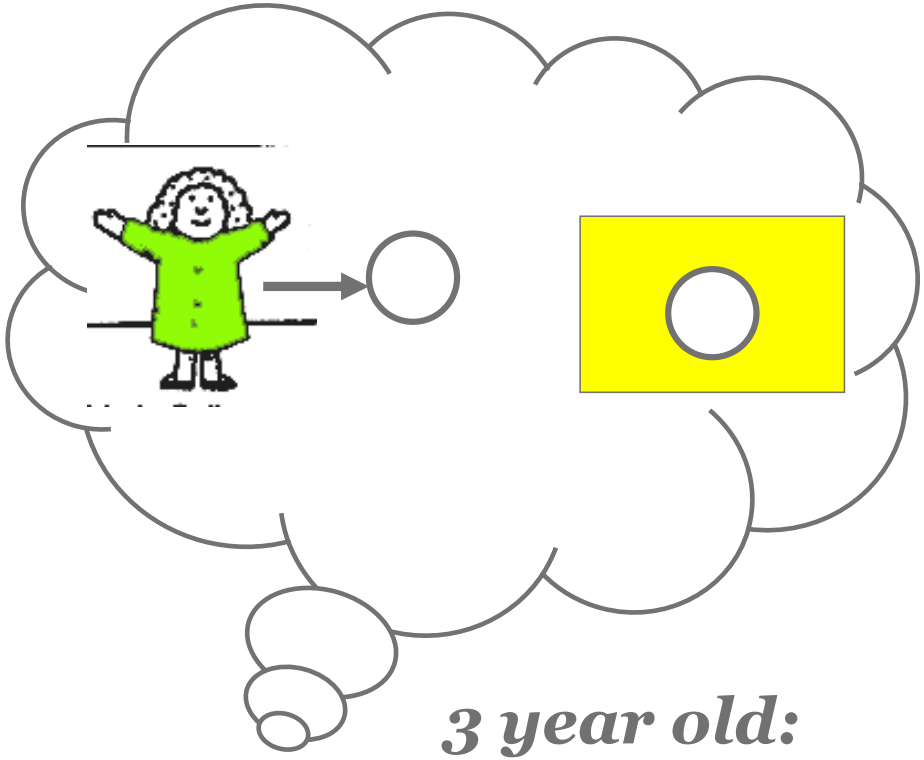
6- & 9-month olds look longer - *intentions* **3-month olds look longer - *actions***

Woodward, 1998

Courtesy of Elsevier. Used with permission.

Intro to Theory of Mind

Action prediction based on false belief is *different* from the prediction based on reality.



3 year old:

"In the box."



Where will Sally look for her ball?

The Sally-Anne problem



Sally Anne



(Wimmer & Perner 1983, Wellman, Cross and Watson 2001)

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Intro to Theory of Mind

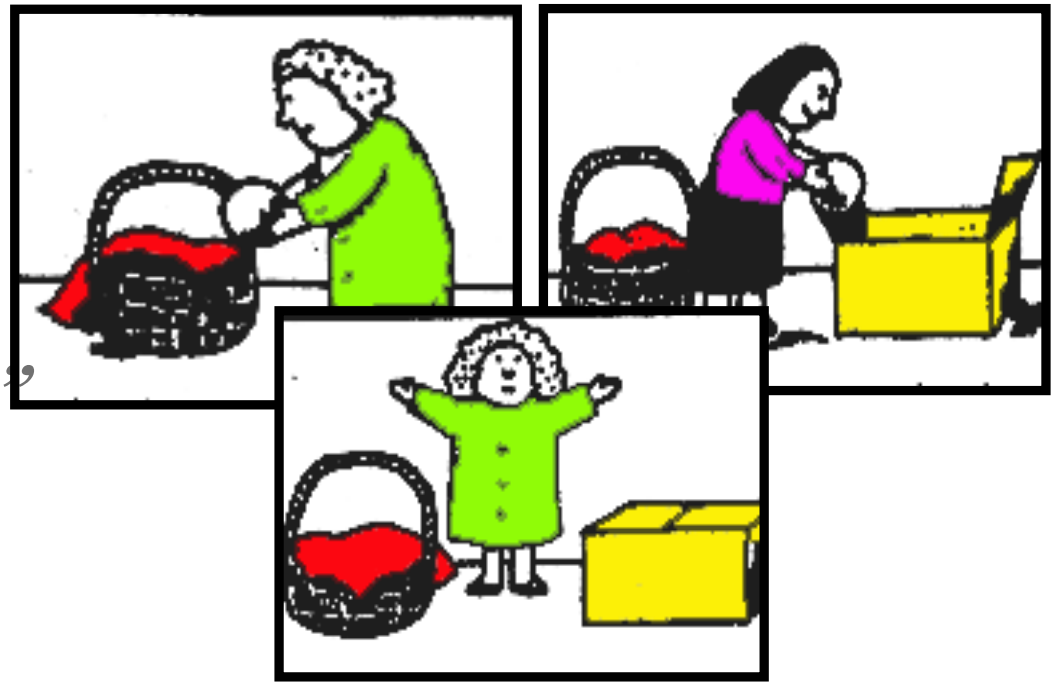
Action prediction based on false belief is *different* from the prediction based on reality.



The Sally-Anne problem



Sally Anne



5 year old:

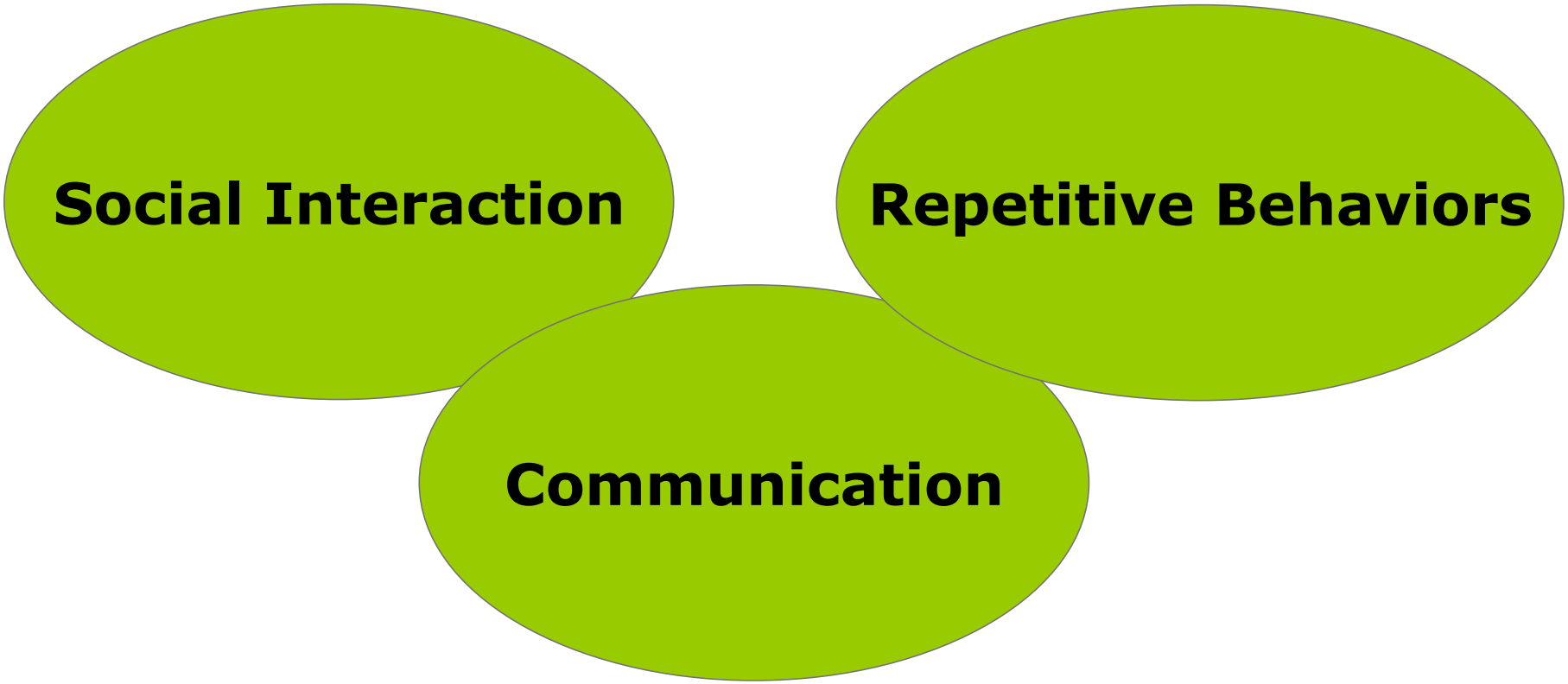
"In the basket."

Where will Sally look for her ball?

(Wimmer & Perner 1983, Wellman, Cross and Watson 2001)

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Autism



Prevalence: 1/140
Male/female ratio 4:1-10:1

Autism: Theory of Mind Deficit

- typical 4 year olds
- IQ matched 6-12 year olds with autism
- false picture control

(photo of object in a location, object moved, still in picture?)

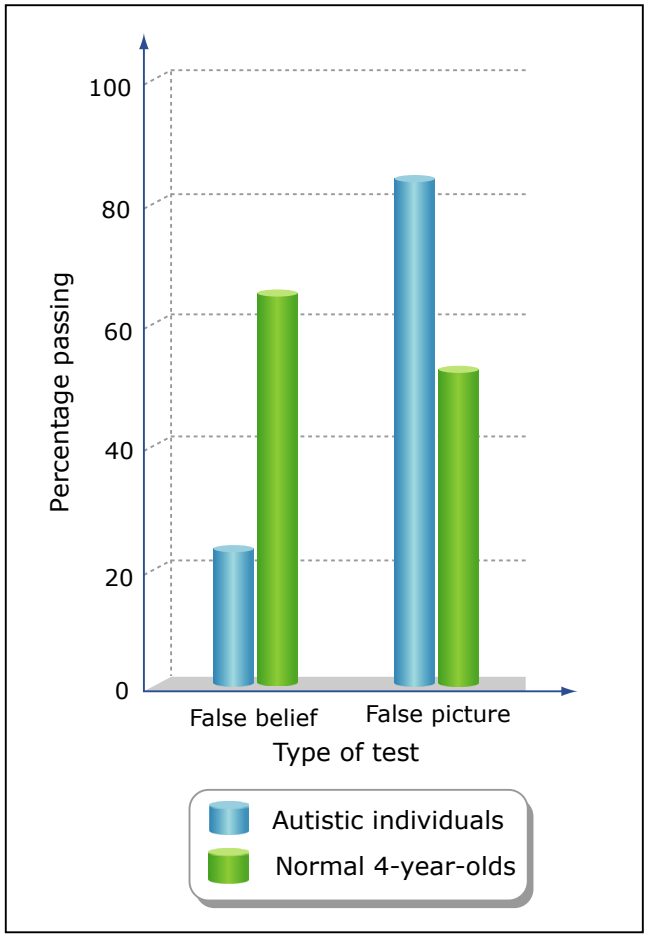


Image by MIT OpenCourseWare.

Mental Flexibility & Theory of Mind

Video “A Change of Mind,” Scientific American Frontiers: Developmental Psychology removed due to copyright restrictions.

Concrete & Formal Operational

Concrete operations (7-11)

- **logical operations with concrete entities (water)**
 - **no so much abstract**
 - **8-9 year olds - 4 is even, 4+1 is odd, but not**
 - **broader abstraction that even + 1 = odd**

Formal operations (12 on ...)

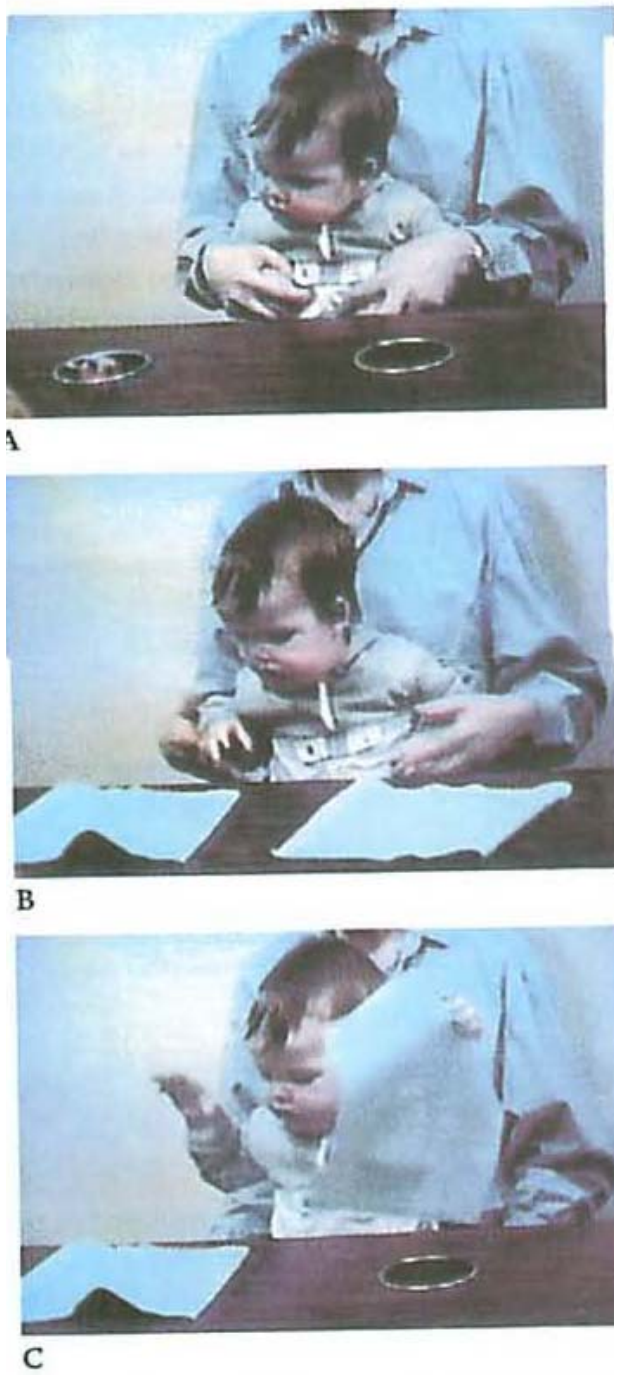
- **logical operations with abstract entities**
- **hypothetical, deductive reasoning, propositional thinking**

Criticism of Piaget

Stage-like versus continuous development

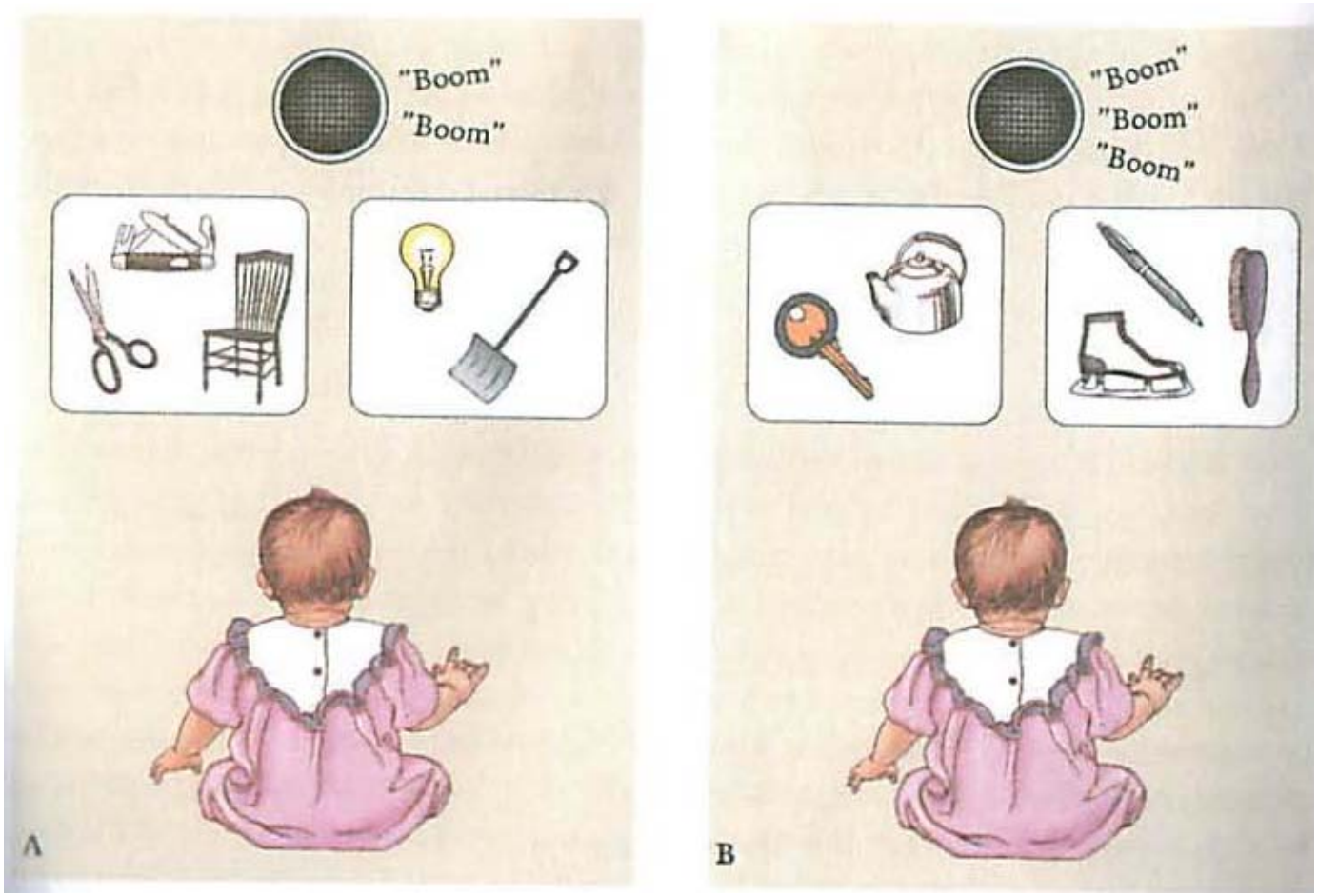
Age

Children achieve many of the stages set by Piaget earlier (including object permanence)



A dissociation between what the infant knows and what the infant does. (A) A seven-month-old looks at a toy that has just been placed in B, one of the two wells. (B) He continues to look at well B after both wells are covered. (C) When finally allowed to reach for the toy, he uncovers well A, in which he found the toy on a previous trial, rather than well B, in which he saw the toy being placed. In this particular sequence, he actually still looks at B while uncovering A, suggesting a dissociation between what the infant knows and what he does.

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Some rudiments of number in six-month-olds. Six-month-olds were shown two panels that contained either two or three simple objects. Concurrently, a drum was sounded over a loudspeaker, producing rhythmic booms either in twos ("boom, boom") or in threes ("boom, boom, boom"). (A) When the drum was sounded "boom, boom," the baby looked at the panel that contained two items. (B) When the drum sounded "boom, boom, boom," the baby looked at the panel that contained three items. This result suggests that the baby has some rudimentary concept of twoness and threeness, a concept that holds whether the items "counted" are visual objects or sounds

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Infants Performing Addition and Subtraction

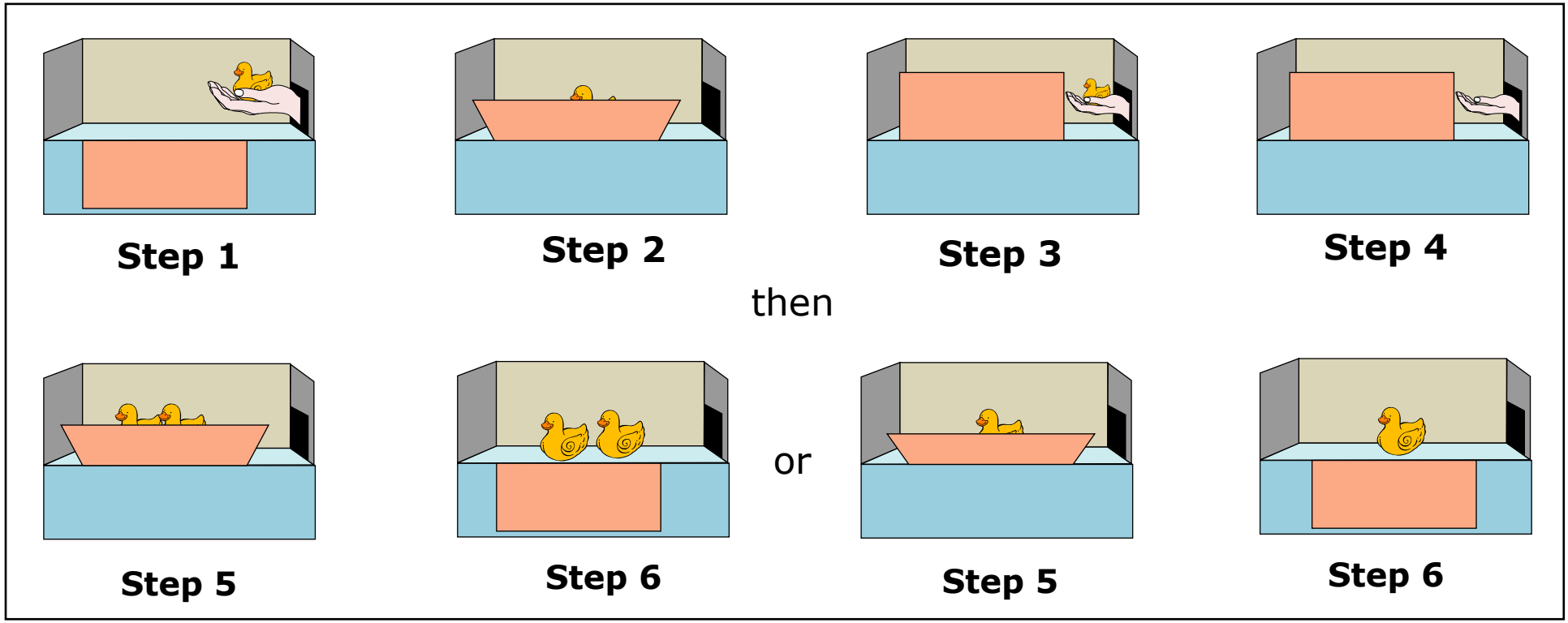
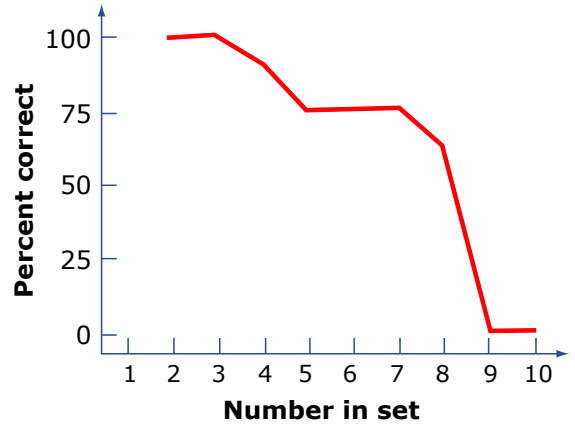


Image by MIT OpenCourseWare.

Counting: Innate or Cultural ?



(a)



Counting abilities seem to be determined in part by culture. Members of the Pirahã tribe were asked to perform a counting task. While they showed high levels of accuracy with one or two items, their success rates fell drastically after three items, and could not count more than nine items.

Image by MIT OpenCourseWare.

One, two, many **may be innate**
Differentiating *many* may be cultural

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ADULT DEVELOPMENT

John Gabrieli

9.00



Photo courtesy of Keith Yahl on Flickr. CC-BY.

What walks with four legs in the morning, two legs in the afternoon, and three legs in the evening?



Erik Erikson

(1902 -1994)

Photo courtesy of Michael Britt on Flickr. CC-BY-NC-SA.

Age	Stage of Development	Developmental Task
Infancy	Trust vs Mistrust	Attachment & Bonding
Early Childhood	Autonomy vs Shame & Doubt	Potty training & Self-Maintenance
Early School	Initiative vs Guilt	Academic success, adding, abc's, making friends
School Age	Industry vs Inferiority	Social competence friendship network
Adolescence	Identity vs Role Confusion	Loyalty & friendship
Young Adulthood	Intimacy vs Isolation	Falling in love, maintaining a relationship
Maturity	Generativity vs Stagnation	Having & Nurturing children
Old Age	Integrity vs Despair	Imparting Wisdom to others

Trust vs Mistrust (Infancy)



Photo courtesy of imnewtryme on Flickr. CC-BY-NC-SA.

Attachment & bonding

Autonomy vs. Shame & Doubt (Early Childhood)



Photo courtesy of bansal98 on Flickr. CC-BY.

Potty training & self-maintenance

Initiative vs Guilt
(Early School)



Photo courtesy of gurana on Flickr. CC-BY-NC-SA.

Academic success, adding, abc's, making friends

Industry vs Inferiority (School Age)



Photo courtesy of Stein Ove Korneliussen on Flickr. CC-BY.

Social competence, friendship network

Identity vs Role Confusion (Adolescence)



Photo courtesy of More Good Foundation on Flickr. CC-BY-NC.

Loyalty & friendship

Intimacy vs Isolation (Young Adulthood)



Photo courtesy of Taylor Pokrop on Flickr. CC-BY-NC-SA.

- Falling in love, maintaining a relationship

Generativity vs Stagnation (Maturity)



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Having & nurturing children

Integrity vs Despair
(Old Age)

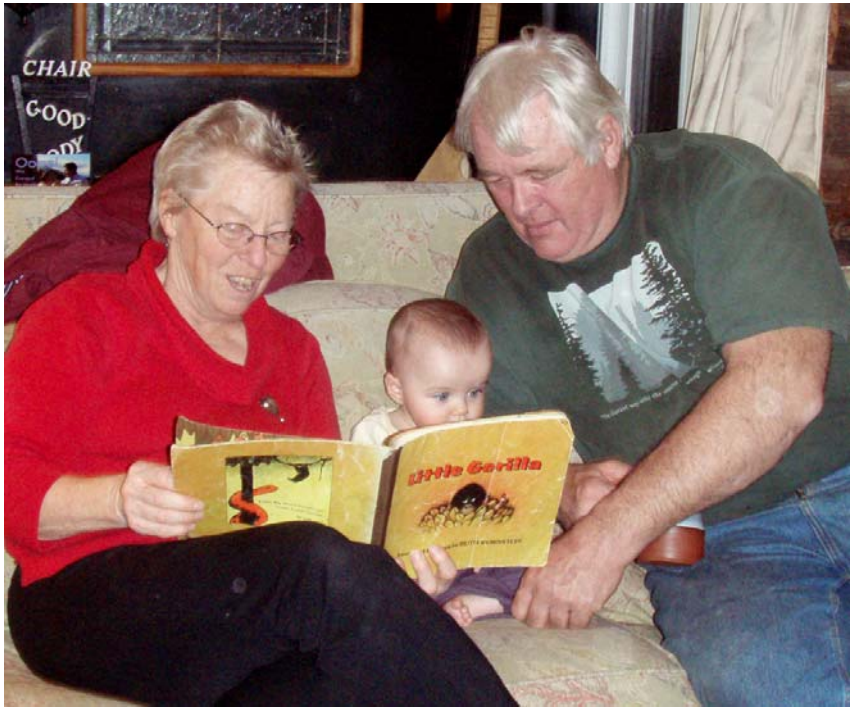


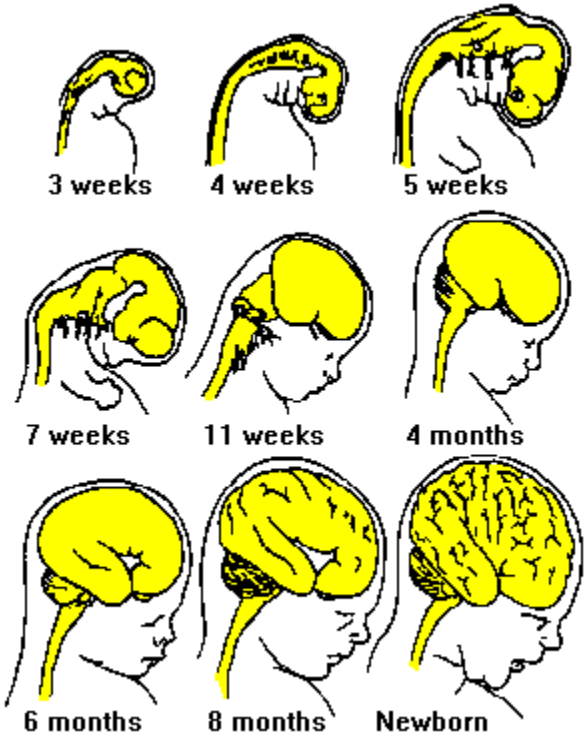
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Imparting wisdom to others

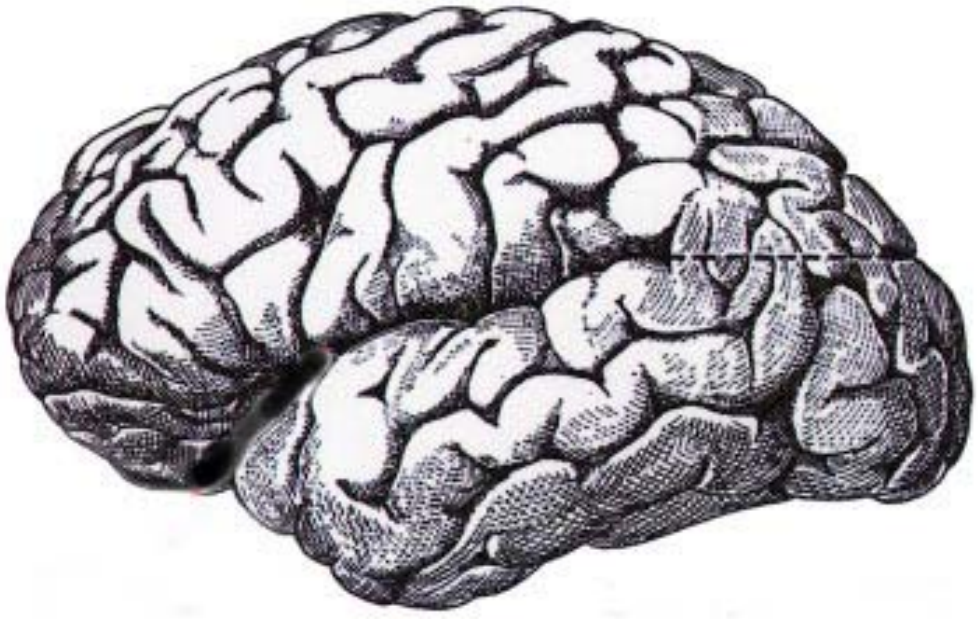
ADULT DEVELOPMENT

- brain development from infancy to young adulthood
- cognitive stability & decline in adulthood
- alteration in hemispheric asymmetry with age
- exercise, aging, & the brain
- socioemotional selectivity & amygdala
- reward system of the brain
- gist vs. specificity in decision making

Complexity…



Courtesy of Eric H. Chulder. Used with permission.



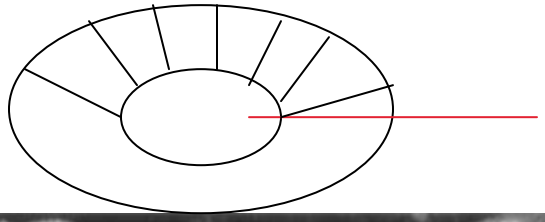
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1×10^{9} neurons

1×10^{12} synapses

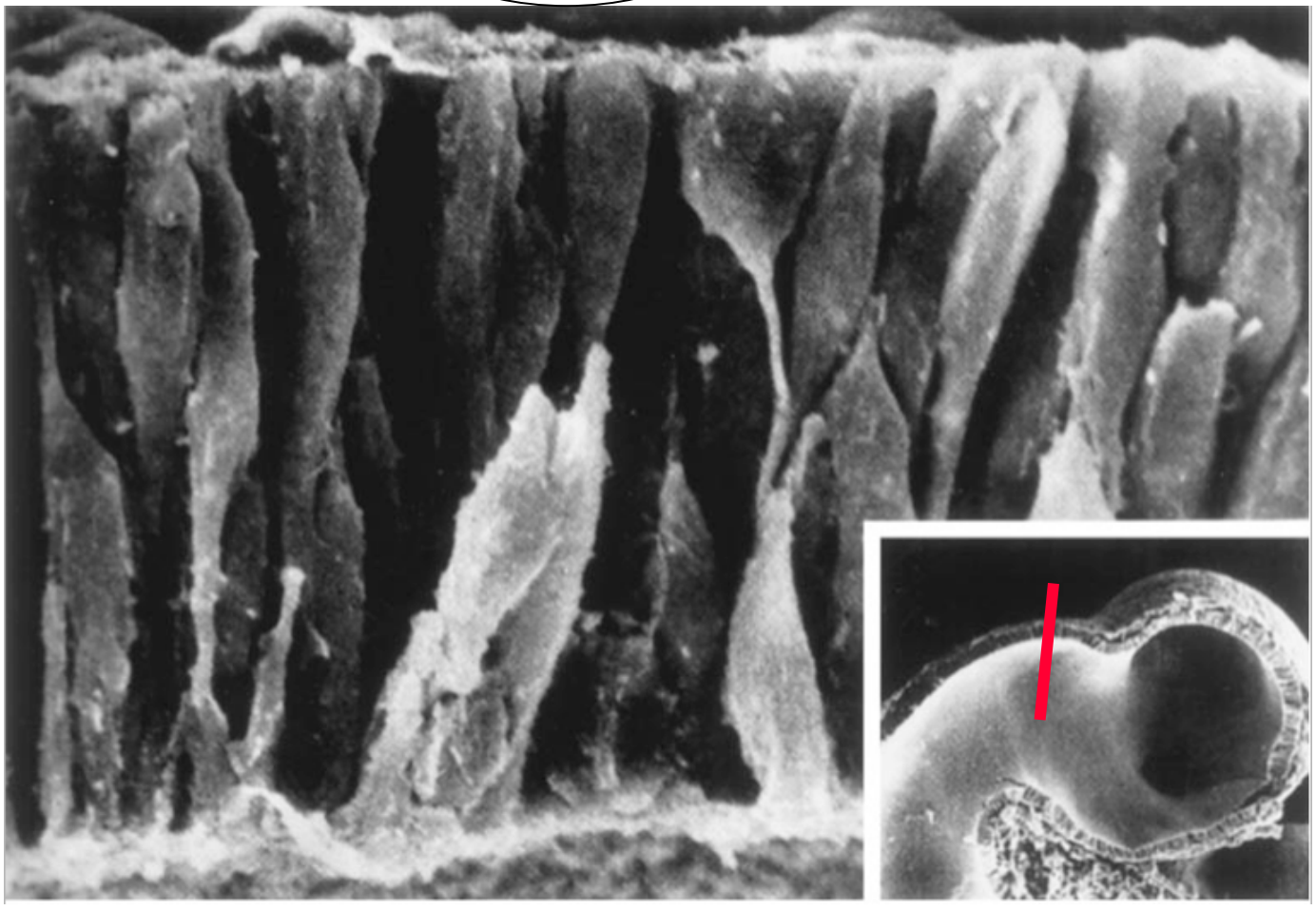
i.e., 1000 connections/neuron

…Neurogenesis



Ventricle

Outer surface



Ventricular surface

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Summary of Neurogenesis

- **Cells divide along the ventricular zone**
- **Earliest neurons during the 2rd embryonic week (EW)**
- **Peak production during the 7th EW - 500,000 neurons/minute**
- **Mostly completed by 18th EW, but continues in adults(??)**
- **Excess production followed by programmed cell death**

e.g., Frontal lobe neuron density is:

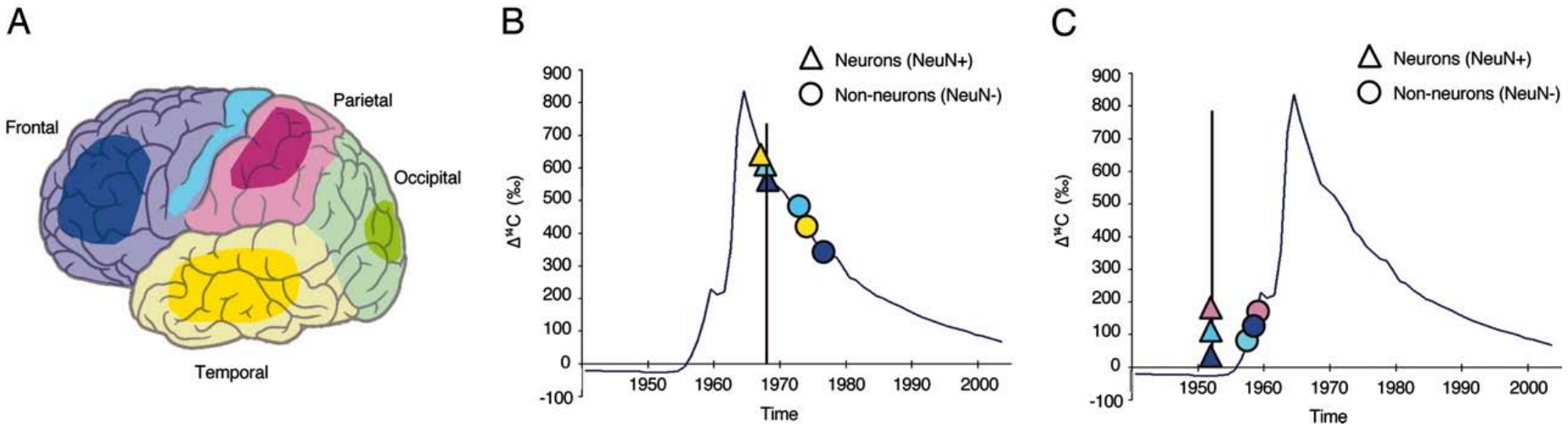
55% above adults at age 2
20% above adults at age 5
10% above adults at age 7

Neurogenesis in Adult Brain?

- for many years, answer was no in mammalian brains
- neurogenesis in granule cells in olfactory bulb & dentate gyrus of hippocampus
- Gould thought she observed new neurons in adult primates
- Rakic argues these were really glia

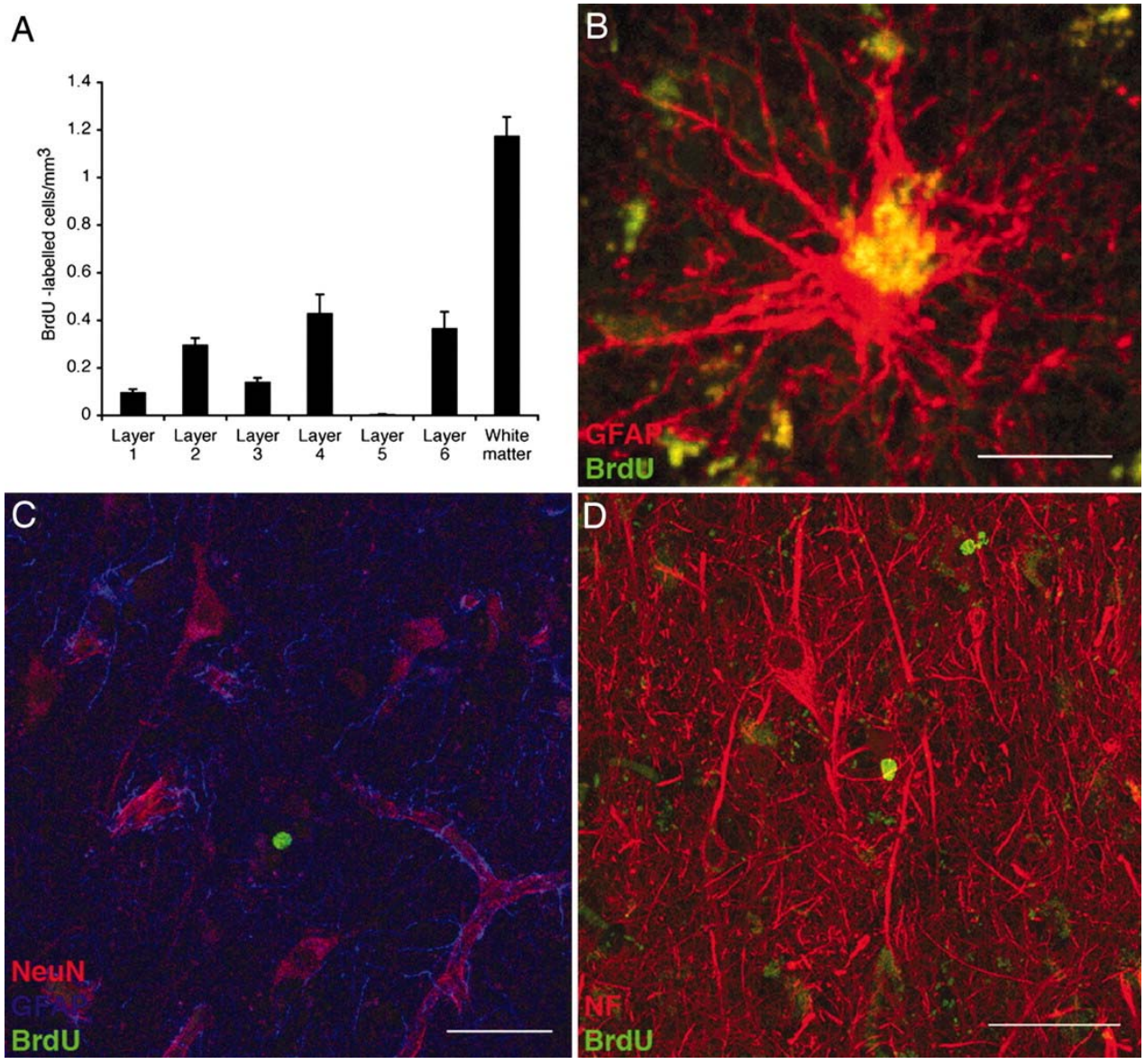
Neurogenesis in Adult Brain?

- **Bhardwaj, 2006**
- **nuclear bomb tests during Cold War sent 14C into atmosphere, 1955-1963, Test Ban Treaty, decreased**
- **integrated with DNA, date mark for cell birth**
- **non-neuronal cells are generated, but neurons are *not* generated in adult neocortex**
- **Bromodeoxyuridine (5-bromo-2-deoxyuridine, BrdU) incorporates into newly synthesized DNA**



Neocortical neurons are as old as the individual. (*A*) The cerebral lobes are outlined (the large colored fields), and the cortical area analyzed within each lobe is color-coded. Both prefrontal (blue) and premotor (light blue) areas were analyzed in the frontal lobe. The analysis of occipital cortex was reported in ref. 23. (*B*) A representative example of values obtained from one individual born after the nuclear weapons tests plotted on to the curve of atmospheric ^{14}C levels indicates that nonneuronal cells turn over, whereas the cortical neurons were generated close to the time of birth. (*C*) A representative example of the analysis of an individual born before the nuclear tests, indicating no measurable cortical neurogenesis. The ^{14}C level in the nonneuronal cells demonstrates there is turnover within this population, but there are several possible interpretations of these data, and the age of this population cannot be concluded from this material alone. The coloring of symbols in *B* and *C* corresponds to the regions in *A*. Vertical bars in *B* and *C* indicate the birth date of the individual.

Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Bhardwaj, Ratan D., et al. "Neocortical Neurogenesis in Humans is Restricted to Development." *PNAS* 103, no. 33 (2006): 12564-8. Copyright © 2006 National Academy of Sciences, U.S.A.

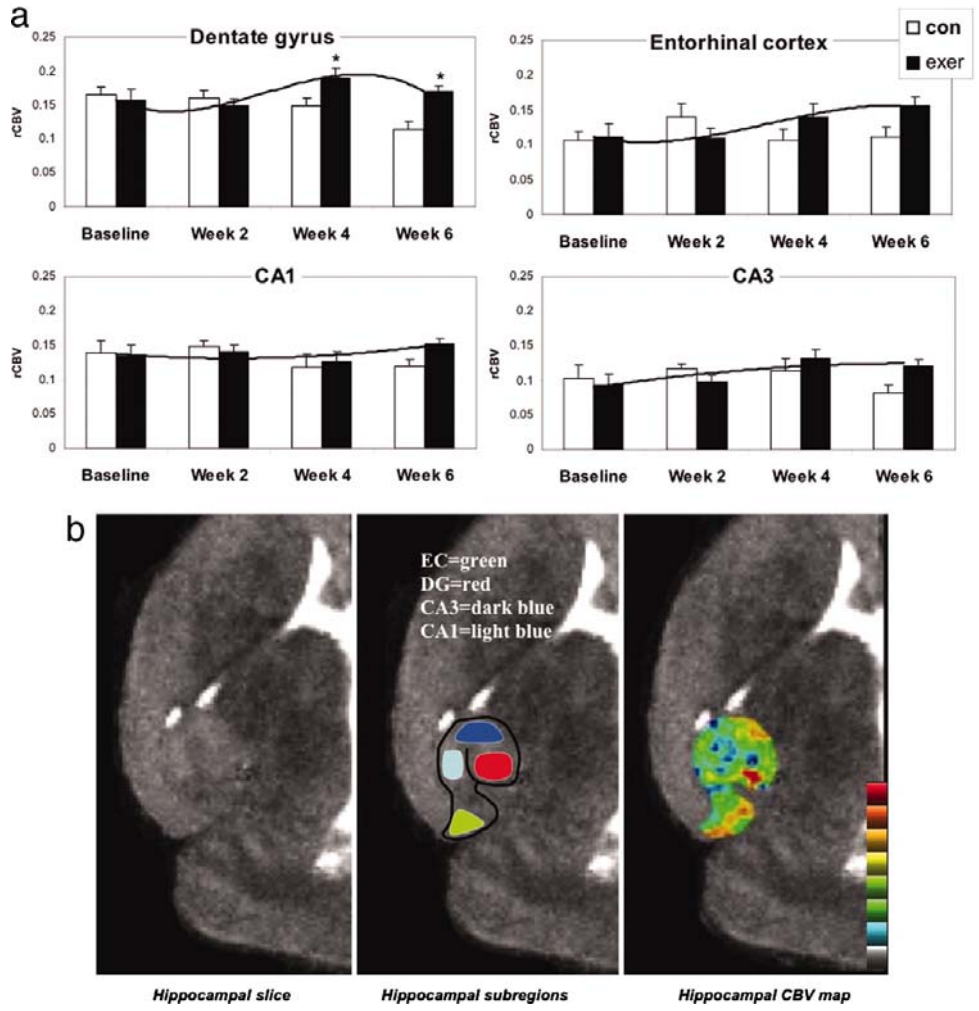


BrdU incorporation in the adult human cerebral cortex. (*A*) Distribution of BrdU-labeled cells in the adult human motor cortex. (*B*) A subset of BrdU-labeled cells are immunoreactive to the astrocyte marker GFAP. (*C* and *D*) None of the BrdU-labeled cells are immunoreactive to the neuronal markers NeuN (*C*) or neurofilament (*D*). [Scale bars, 70 μm (*B*) and 100 μm (*C* and *D*).]

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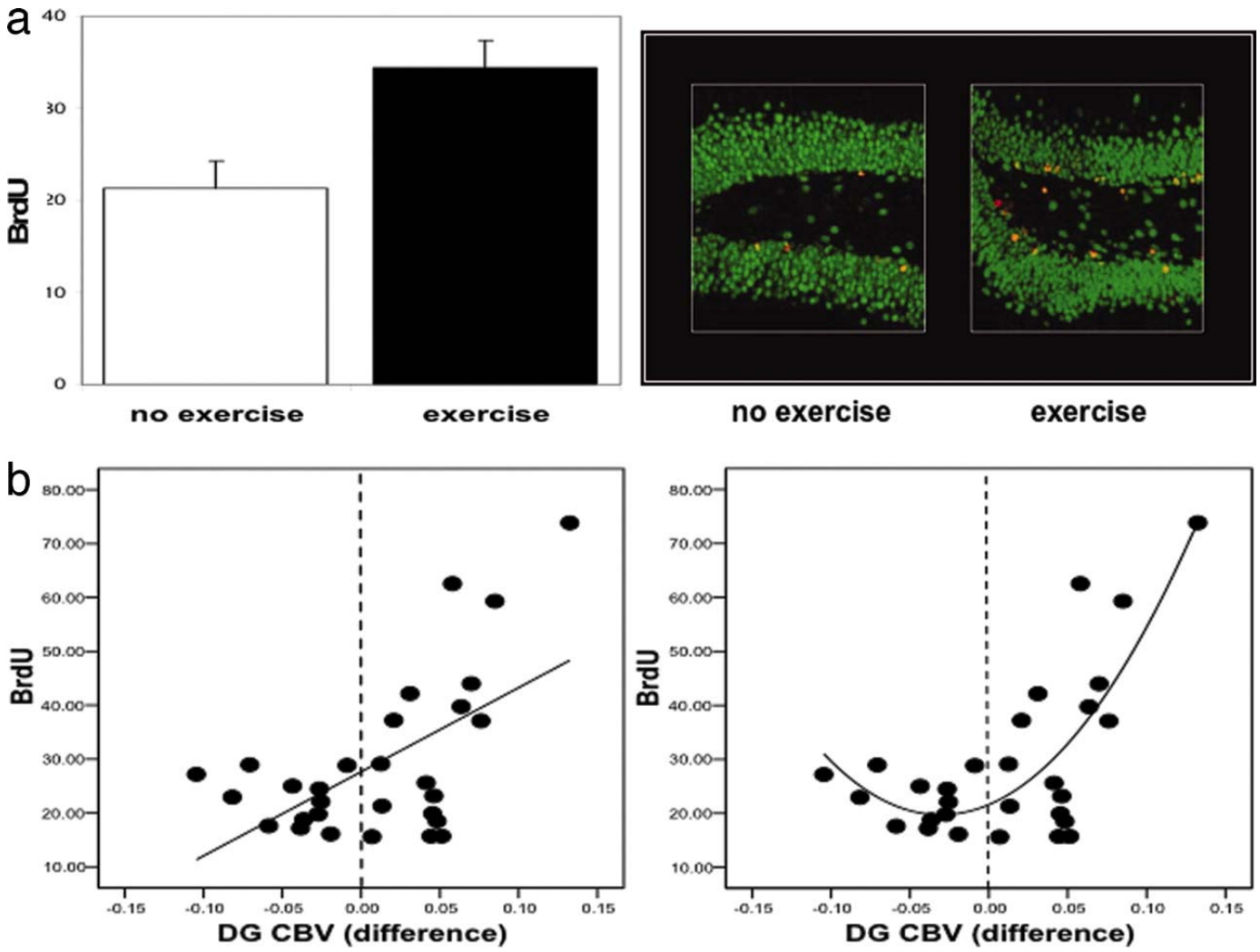
Exercise-Induced Neurogenesis

- measure cerebral blood volume (CBV) in hippocampus, including dentate
- exercise in mice selectively increases CBV in dentate
- exercise-induced increases in dentate CBV correlated with post-mortem measures of neurogenesis
- in humans (12 weeks, 4/wk, 1hr) selective effect on dentate CBV, CBV changes correlate with cognitive functions



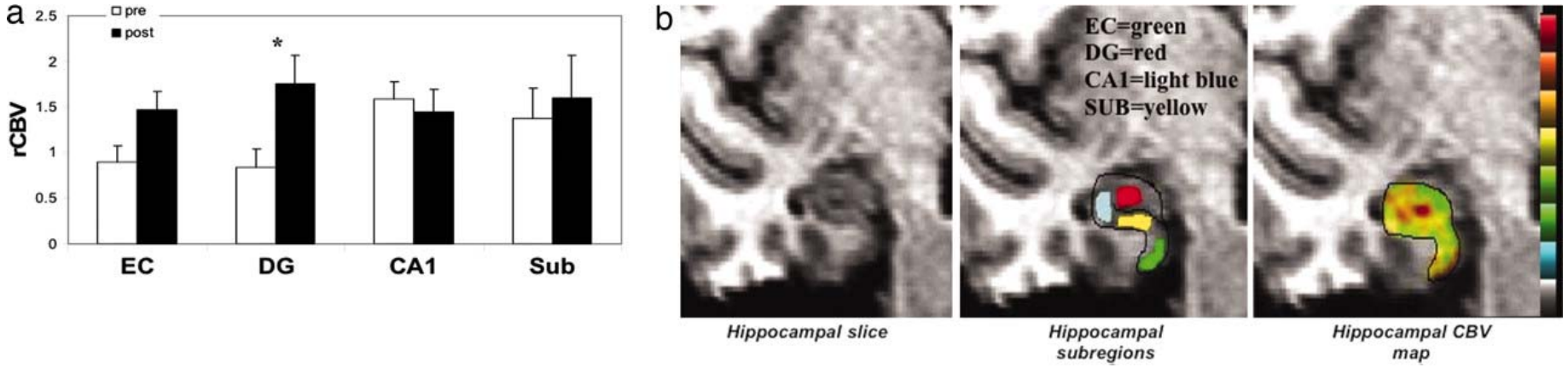
Exercise selectively increases dentate gyrus CBV in mice. (*a*) Exercise had a selective effect on dentate gyrus CBV. Bar graphs show the mean relative CBV (rCBV) values for each hippocampal subregion in the exercise group (filled bars) and the nonexercise group (open bars) over the 6-week study. The dentate gyrus was the only hippocampal subregion that showed a significant exercise effect, with CBV peaking at week 4, whereas the entorhinal cortex showed a nonsignificant increase in CBV. (*b*) An individual example. (*Left*) High-resolution MRI slice that visualizes the external morphology and internal architecture of the hippocampal formation. (*Center*) Parcellation of the hippocampal subregions (green, entorhinal cortex; red, dentate gyrus; dark blue, CA3 subfield; light blue, CA1 subfield). (*Right*) Hippocampal CBV map (warmer colors reflect higher CBV).

Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Pereira, Ana C., et al. "An In Vivo Correlate of Exercise-Induced Neurogenesis in the Adult Dentate Gyrus." *PNAS* 104, no. 13 (2007): 5638-43. Copyright © 2007 National Academy of Sciences, U.S.A.



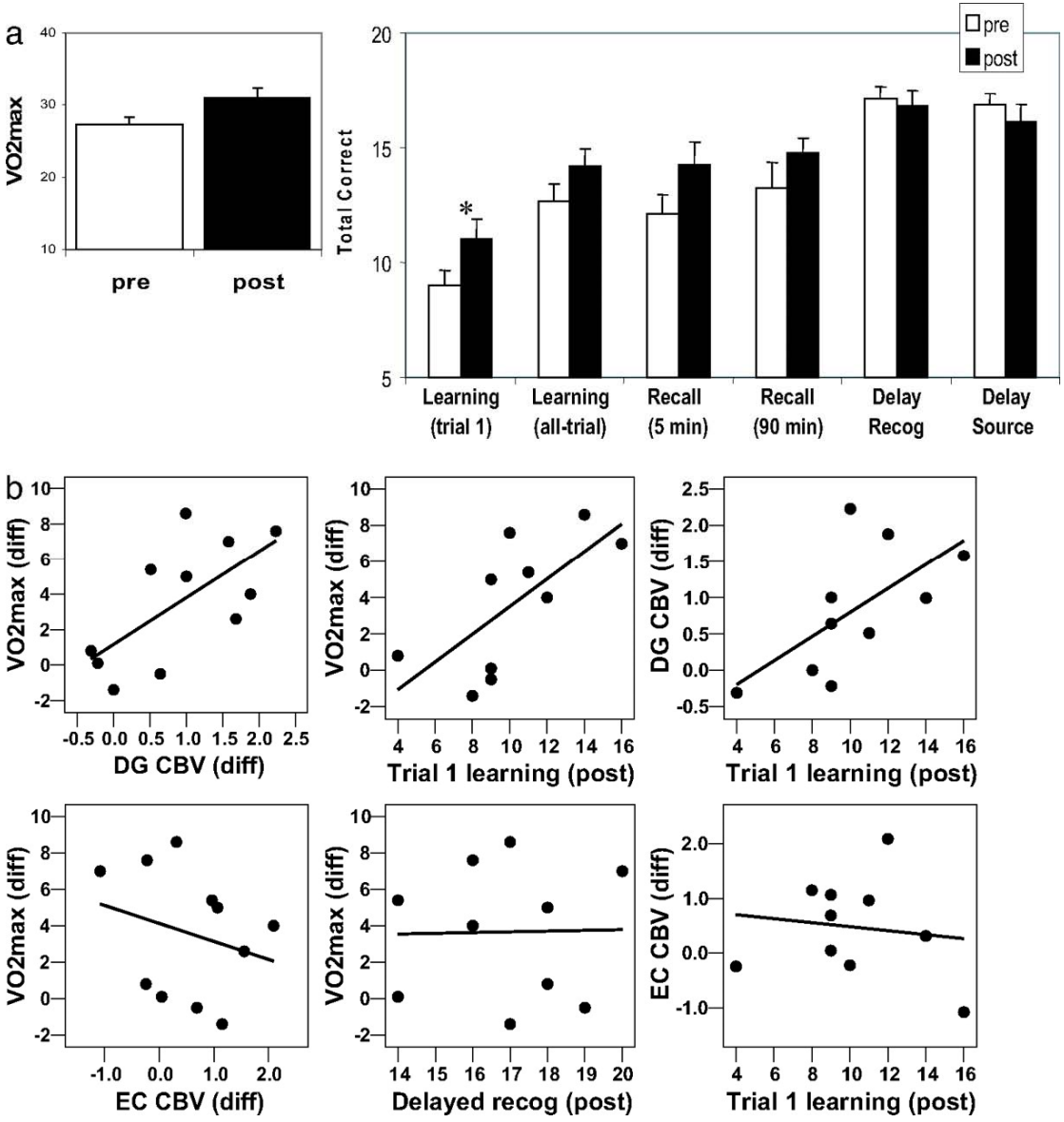
Exercise-induced increases in dentate gyrus CBV correlate with neurogenesis. (*a*) (*Left*) Exercising mice were found to have more BrdU labeling compared with the no-exercise group. (*Right*) As shown by confocal microscopy, the majority of the new cells were colabeled with NeuN (red, BrdU labeling; green, NeuN; yellow, BrdU/NeuN double labeling). (*b*) (*Left*) A significant linear relationship was found between changes in dentate gyrus CBV and BrdU labeling. (*Right*) A quadratic relationship better fits the data. The vertical stippled line in each plot splits the *x* axis into CBV changes that decreased (left of line) versus those that increased (right of line) with exercise.

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Exercise selectively increases dentate gyrus CBV in humans. (*a*) Exercise had a selective effect on dentate gyrus CBV. Bar graph shows the mean relative CBV (rCBV) values for each hippocampal subregion before exercise (open bars) and after exercise (filled bars). As in mice, the dentate gyrus was the only hippocampal subregion that showed a significant exercise effect, whereas the entorhinal cortex showed a nonsignificant increase in CBV. (*b*) An individual example. (*Left*) High-resolution MRI slice that visualizes the external morphology and internal architecture of the hippocampal formation. (*Center*) Parcellation of the hippocampal subregions (green, entorhinal cortex; red, dentate gyrus; blue, CA1 subfield; yellow, subiculum). (*Right*) Hippocampal CBV map (warmer colors reflect higher CBV).

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Exercise-induced increases in dentate gyrus CBV correlate with aerobic fitness and cognition. (*a*) (*Left*) VO_2max, the gold-standard measure of exercise-induced aerobic fitness, increased after exercise. (*Right*) Cognitively, exercise has its most reliable effect on first-trial learning of new declarative memories. (*b*) (*Left*) Exercise-induced changes in VO_2max correlated with changes in dentate gyrus (DG) CBV but not with other hippocampal subregions, including the entorhinal cortex (EC), confirming the selectivity of the exercise-induced effect. (*Center*) Exercise-induced changes in VO_2max correlated with postexercise trial 1 learning but not with other cognitive tasks, including delayed recognition. (*Right*) Post-exercise trial 1 learning correlated with exercise-induced changes in dentate gyrus CBV but not with changes in other hippocampal subregions, including the entorhinal cortex.

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Cell Migration

- neurons must travel to intended locations
- migration occurs over months and perhaps 8 months postnatally
- across radial glial tracks - following molecular cues
- cell's initial destination and function predetermined as it starts migration

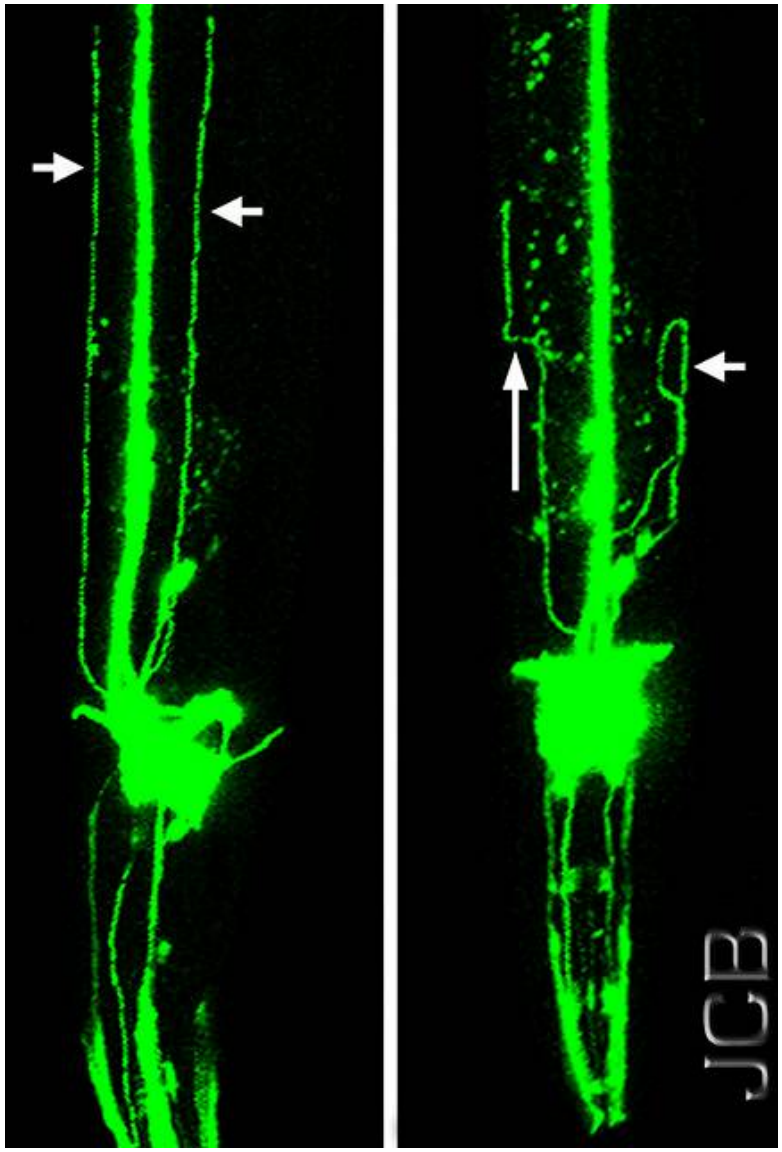
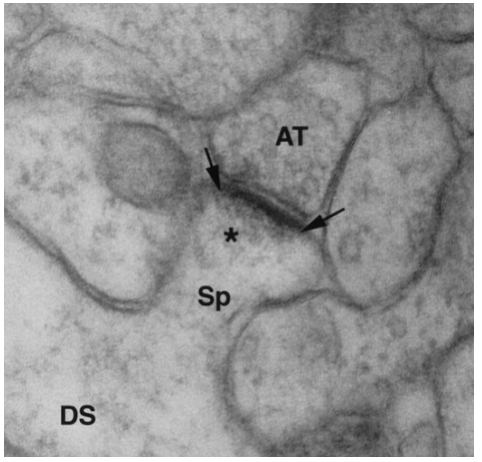


Photo courtesy of The Journal of Cell Biology on Flickr. CC-BY-NC-SA.

Synaptic Formation

- occurs concurrently in all areas, but at different rates in different areas
- prenatal (from 5 weeks in spinal cord) and postnatal (2 years in cortex)
- peak growth - maybe 1.8 million synapses/second
- increase in density until 2 years
 50% lost by age 16 (shedding)
- pruning & selection - activity dependent - use it or lose it
 neural Darwinism - lose 20 billion synapses per day into adolescence

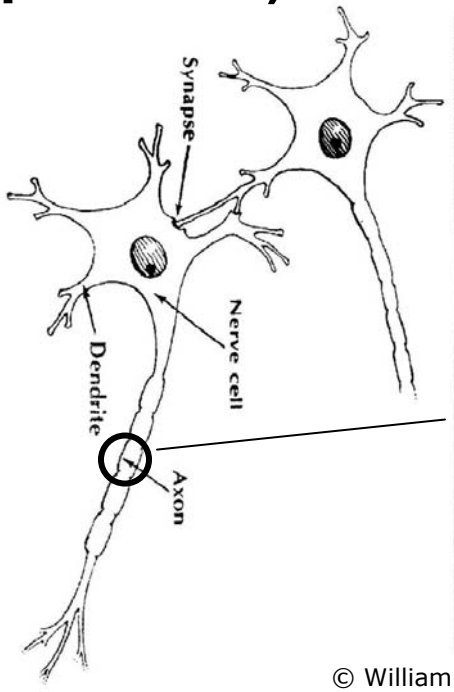


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Myelination

Speeds Signaling along the Axon

- **Myelin: fatty sheath, multiple layers of compacted oligodendroglia membranes**
- **Insulates segments of the axon bioelectrically**
- **Accelerates signal (action potential) conduction velocity**
- **Myelin: "White Matter"**



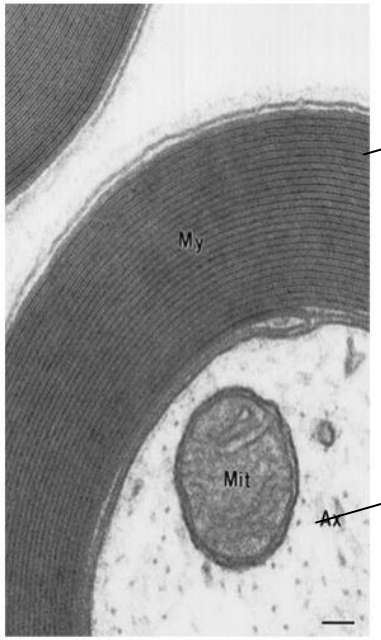
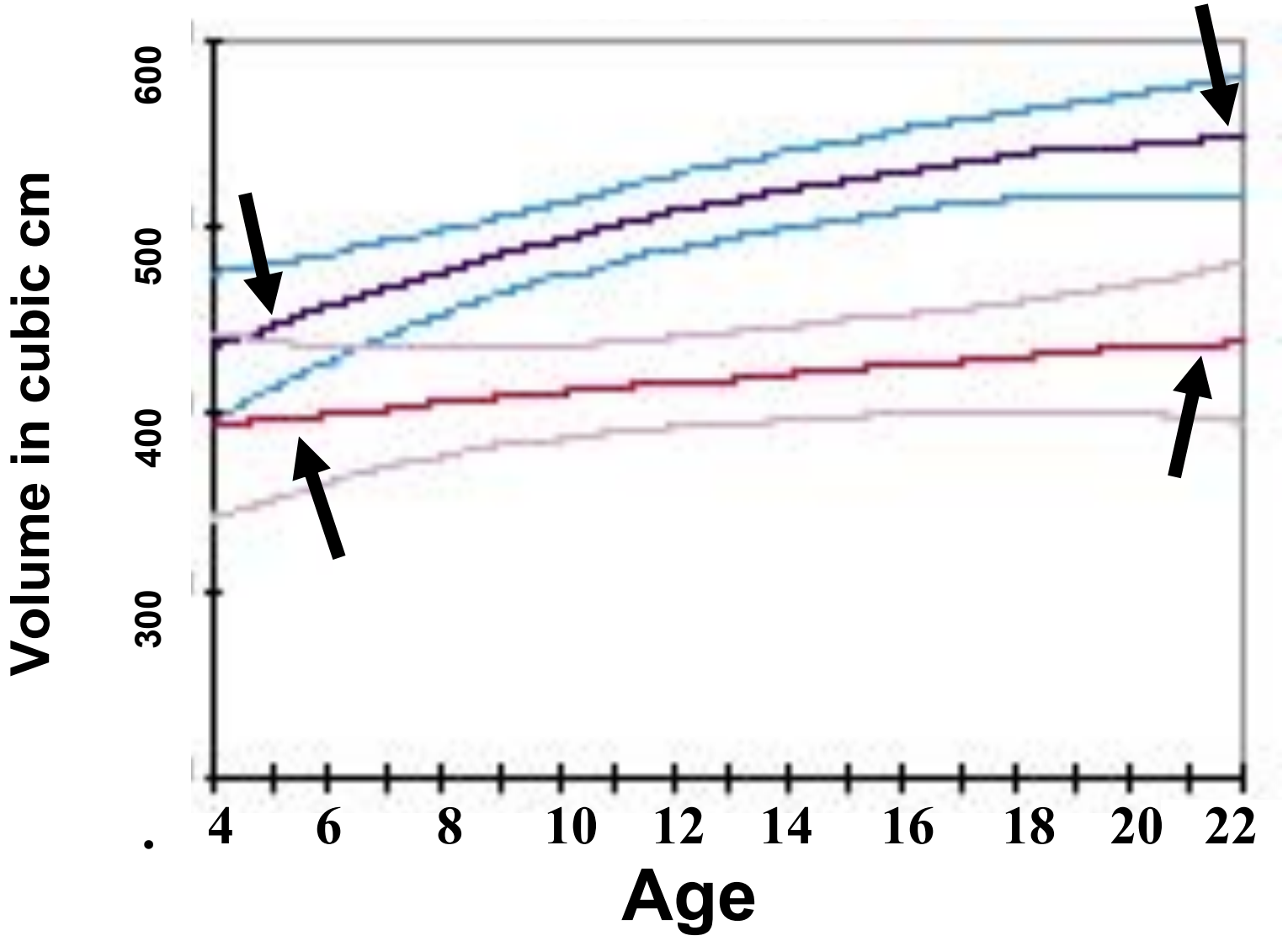


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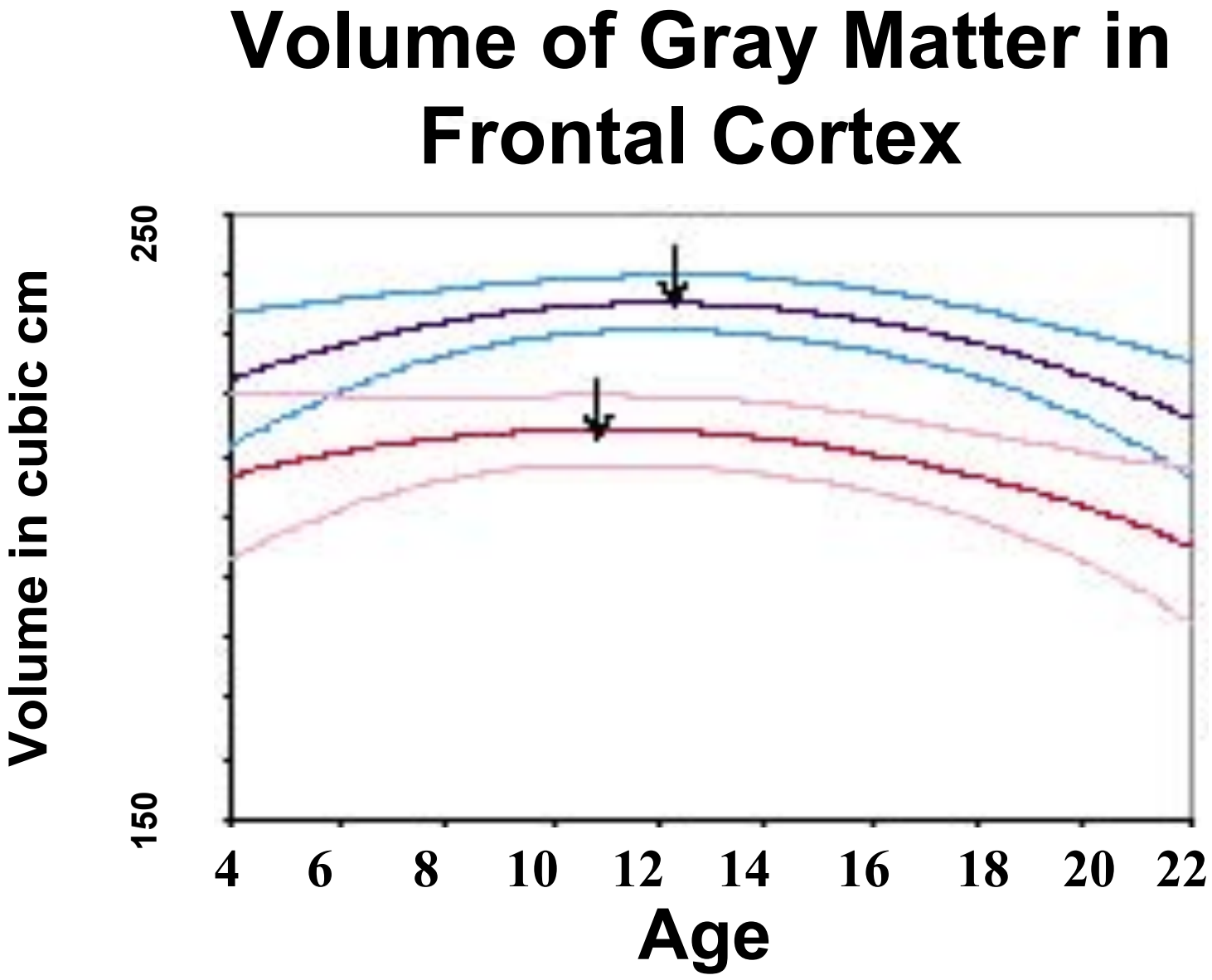
Development of Myelination

Total Volume of White Matter in Brain



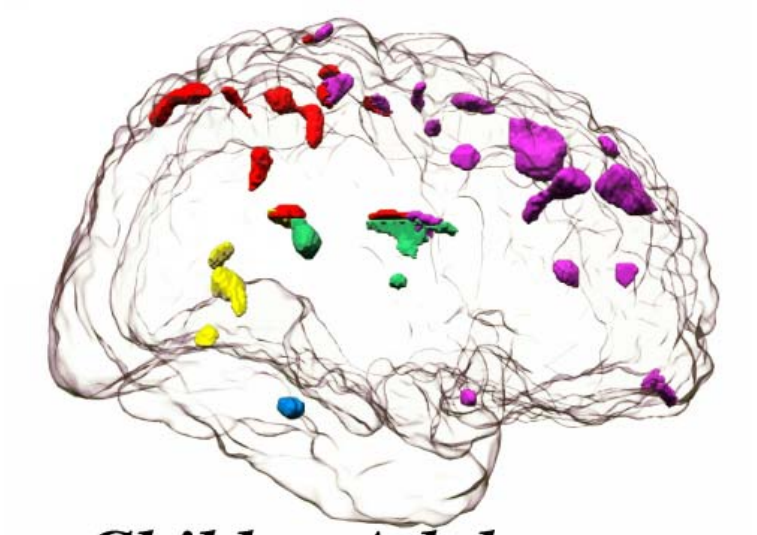
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Maturation of Gray Matter

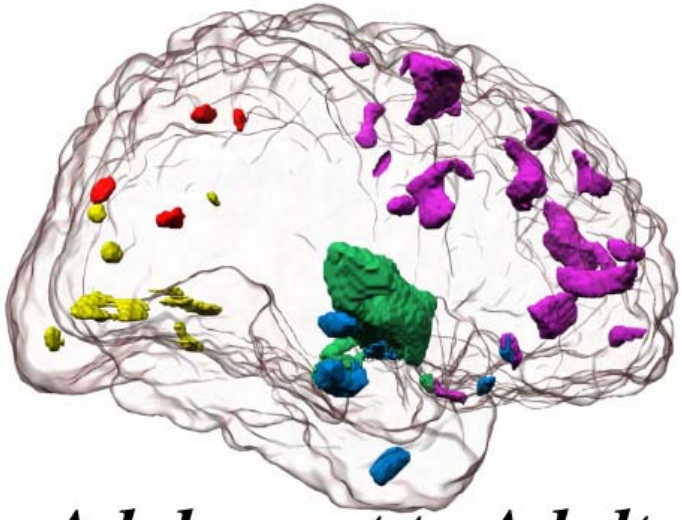


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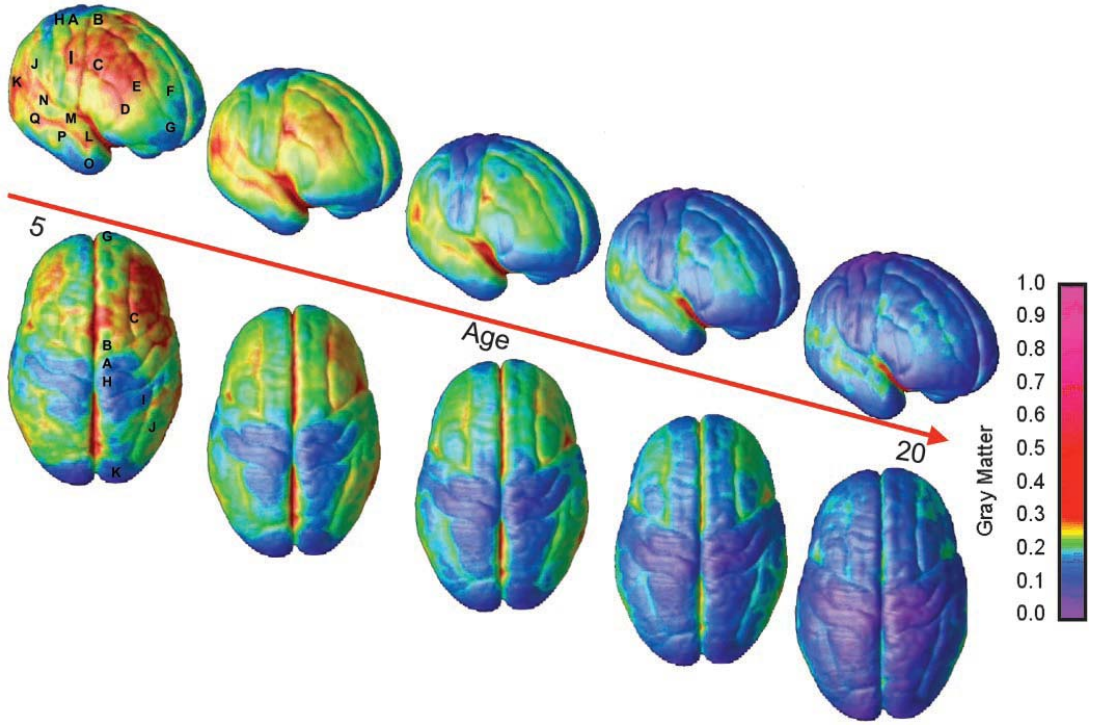
Late Development of Prefrontal Cortex in Adolescence



Child to Adolescent



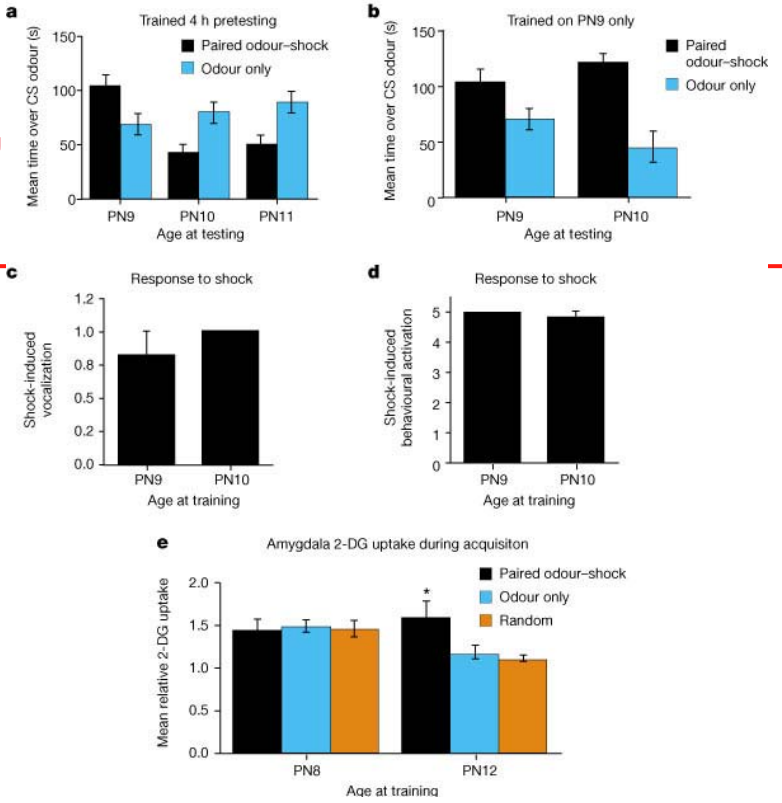
Adolescent to Adult



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Sowell et al., 1999, *NeuroImage*
Sowell et al., 1999, *Nat Neurosci*

"Good Memories of Bad Events in Infancy"



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- fear important for survival
- amygdala essential for learned fear
- fear conditioning - neutral stimulus (odor) paired with aversive stimulus (shock)
- attachment in rats learned postnatally and through olfaction
- young pups (up to postnatal day 9) exposed to odors & shocks approach odors (produces shock-induced vocalizations & physical responses)
- older pups (after day 10) avoid those odors
- amygdala metabolic activity (measured by 2 do-oxyglucose uptake) higher in young pups but did not vary in response to paired presentations of odor-shock vs. odors only or random odors or shocks - selective enhancement of amygdala metabolism for odor-shock pairs in older pups - learning of aversive associations

Interpretation - helpful for newborns? (avoid aversion to caregiver)
early attachment to abusive caregiver?

A Long Future

- for most of human history, life expectancy about 20 years
- 1800s – mid 30s
- 2000 – 77; 2010 – 78
- 50,000 centenarians in US (3x 10 years ago) and expected to be 1 million by 2050; maybe 50% of girls born in 2000 will live for a century
- families may have 4/5 generations alive at once
- giant effects on education, pension, work, financial markets
- old model – manage child, go to college, career, mate, family, retire at 65
- 1/10 over 65 now, in 20 years ¼ over 65

ADULT DEVELOPMENT

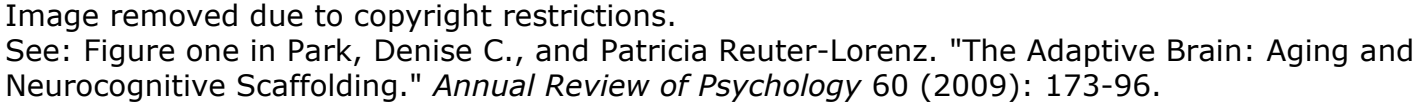
- little studied in middle ages
- contrasts of 20/80 year-olds
- are we done developing at 20?

ADULT DEVELOPMENT

- **cross-sectional vs. longitudinal designs**

Strengths? Limitations?

Cognition and Aging:
Decline and Preservation across the Life Span


Image removed due to copyright restrictions.
See: Figure one in Park, Denise C., and Patricia Reuter-Lorenz. "The Adaptive Brain: Aging and Neurocognitive Scaffolding." *Annual Review of Psychology* 60 (2009): 173-96.

ADULT DEVELOPMENT

- **cross-sectional vs. longitudinal designs**

Cross-sectional

fast

cohort effects

Longitudinal

slow

more accurate

practice effects

Age-related changes in cognition: Cross-sectional vs. Longitudinal data

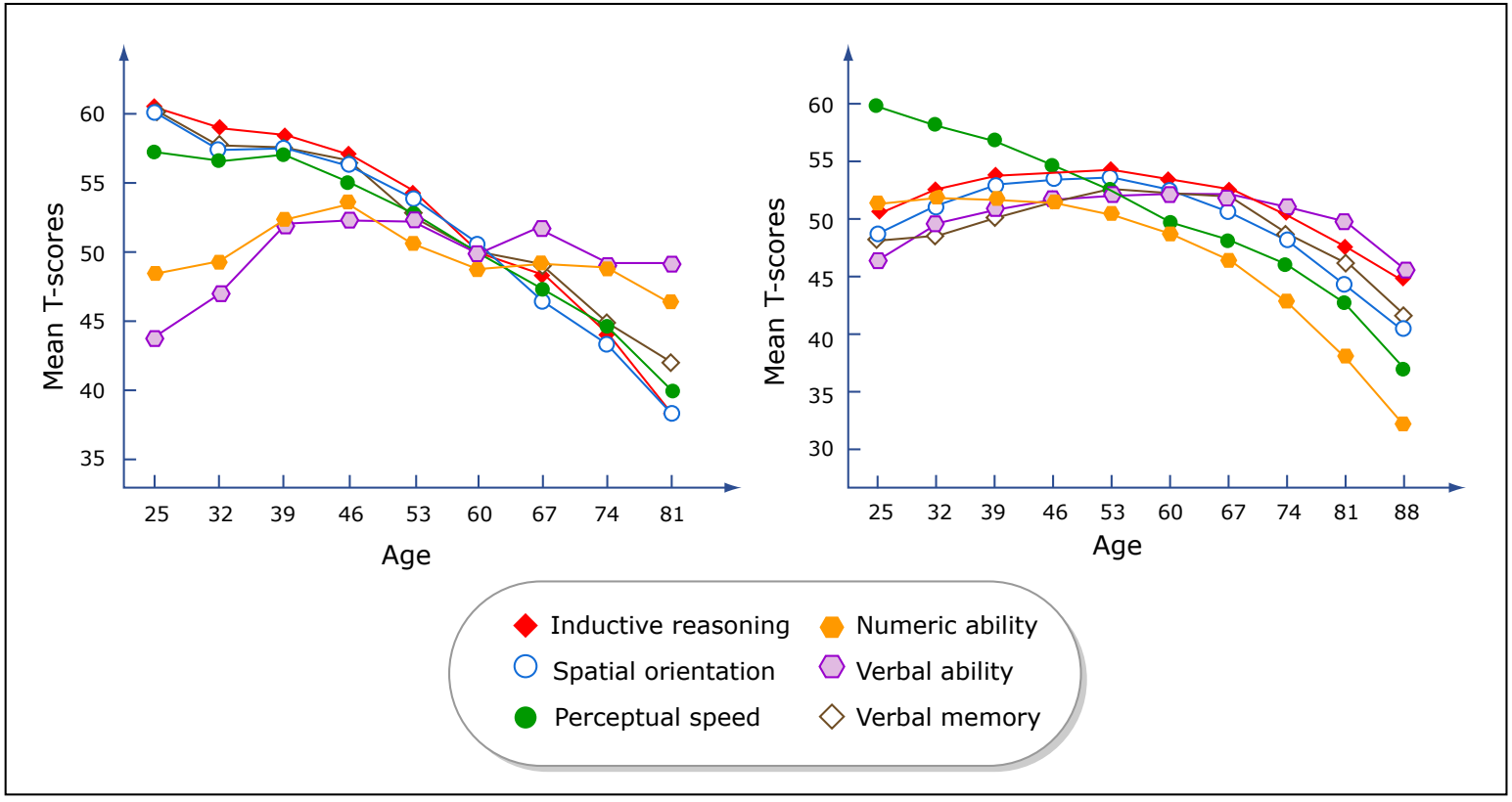


Image by MIT OpenCourseWare.

In cross-sectional data, aging leads to increased knowledge and experience, but decreased processing capacity (WM, memory, speed). Developmental changes in cognition measured (a) cross-sectionally and (b) longitudinally (7-year interval).

Figure based on the Seattle Longitudinal Study at the University of Washington (http://www.uwpsychiatry.org/sls/).

Aging: Loss of Speed vs. Gain in Knowledge/Expertise

- air traffic controllers in Canada – US retirement is 55 – Canada is 65 – age influenced simple processing speed, but not task performance
- 118 pilots – 40-69 years of age – flight simulators – tested 3 times across 3 years – older pilots worse in Year 1 – then were better in Years 2/3

DOES MEMORY DECLINE WITH AGE?

- **yes for declarative memory**
 mildly, steadily in healthy aging
 severely in Alzheimer's disease

- **implicit memory (repetition priming)**
 can be minimally influenced by age
 and even by Alzheimer's disease

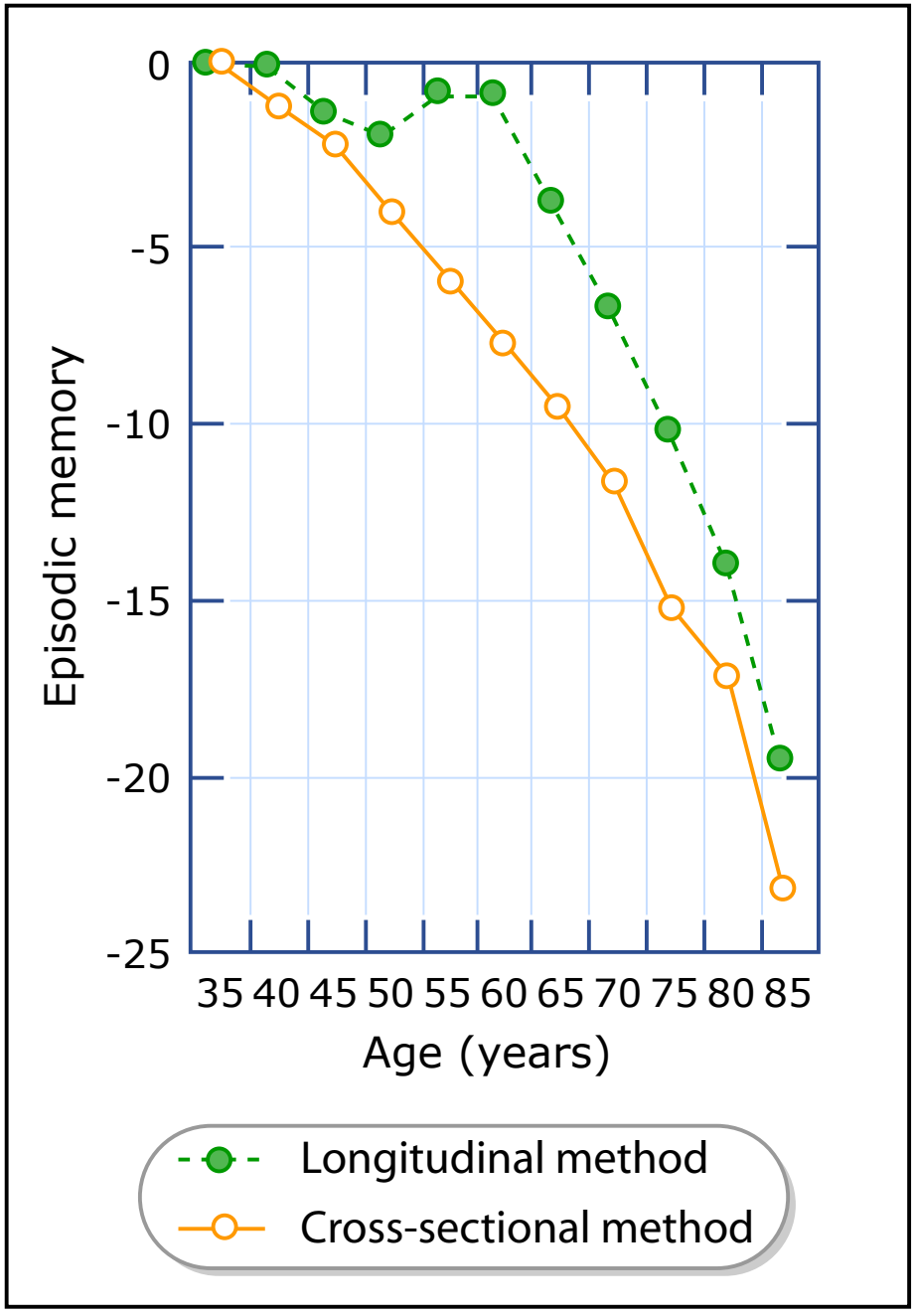
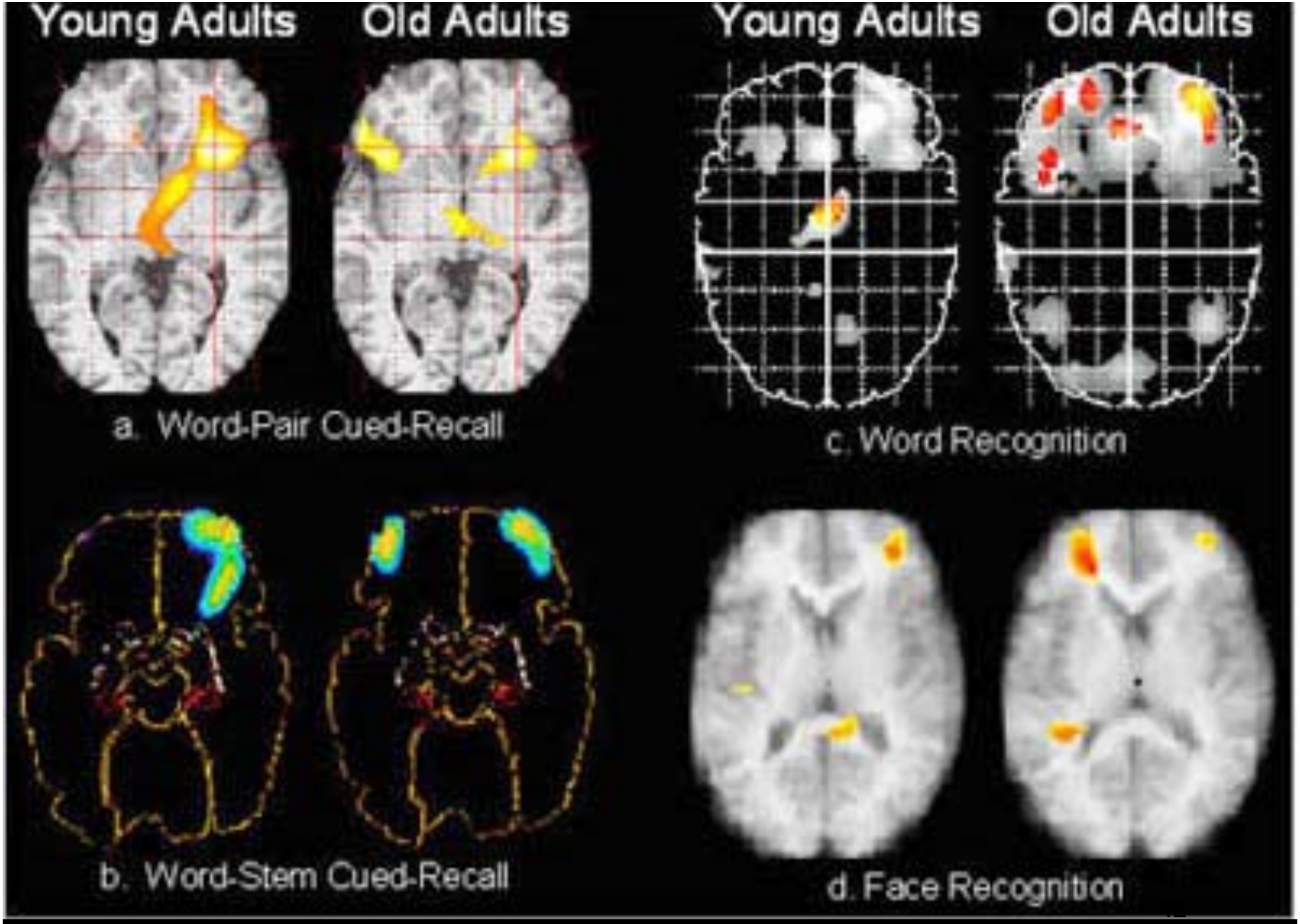


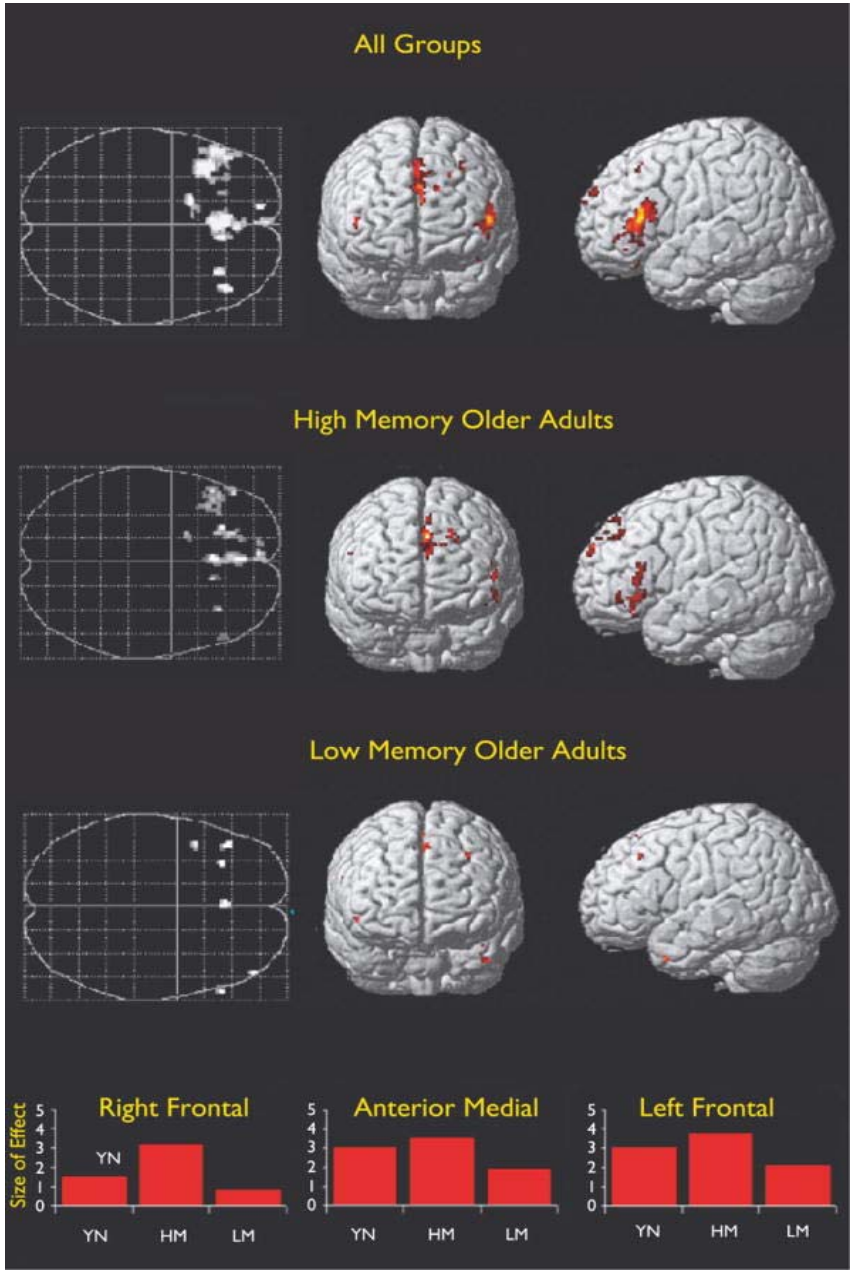
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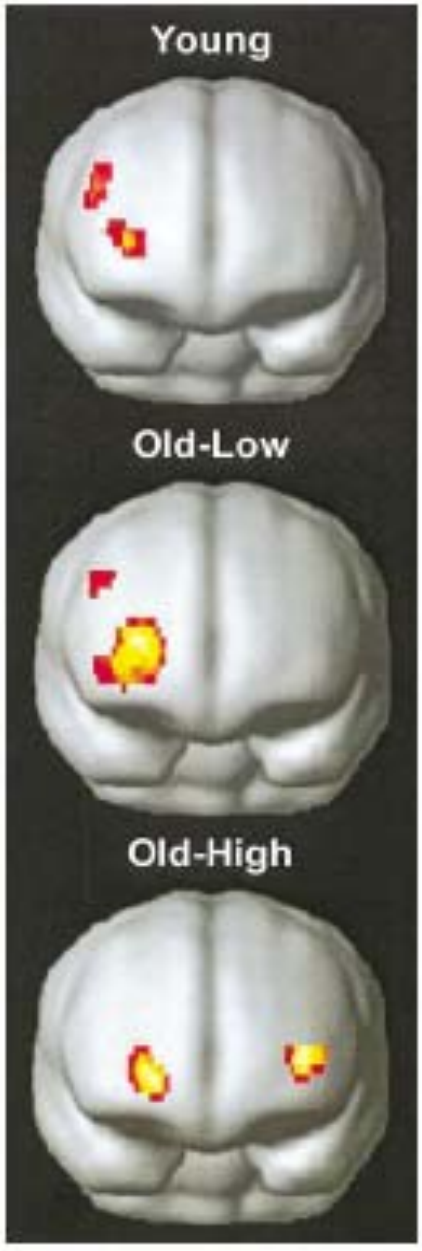
Figures from Cabeza, Roberto. "Hemispheric Asymmetry Reduction In Older Adults: The HAROLD Model." *Psychology and Aging* 17, no. 1 (2002): 85-100. Courtesy of the American Psychological Association. Used with permission.

Reduction of Hemispheric Asymmetry in Aging

- bad? loss of specialization; leakage
- good? compensatory mechanism



Rosen et al., NeuroReport, 2002



Courtesy of Elsevier. Used with permission.

Cabeza et al., NeuroImage, 2002

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Reduction of Hemispheric Asymmetry in Aging

- bad? loss of specialization; leakage
- good? compensatory mechanism
- good - associated with better aging

Factors that Minimize Cognitive Loss

- education (cognitive reserve, not protection from AD)
- lifelong cognitive activity
- high conscientiousness
- exercise

Exercise, Aging, & Brain

- relatively sedentary people over 60 randomly assigned to two groups

- aerobic training (walking, swimming)

- non-aerobic training (toning/stretching)

-hour/day, several times/week, for months

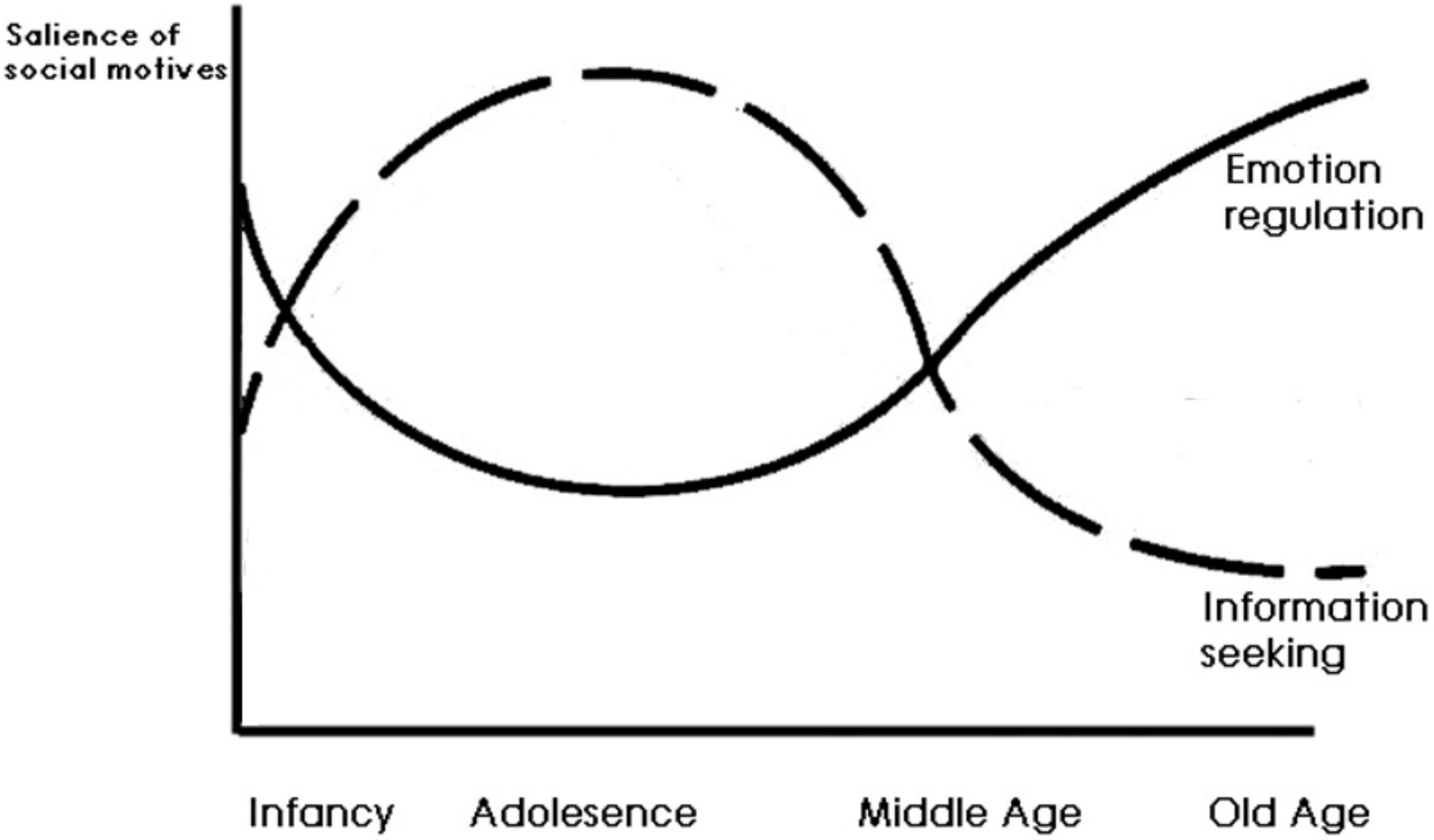
- cognitive benefits? brain changes?

CAN ATTITUDES ABOUT AGING INFLUENCE HEALTHY AGING?

- 440 healthy people under 50 in Baltimore Longitudinal Study of Aging
- questionnaire on attitudes about aging
 - are older people more absent-minded or less intelligent
- examine cardio-vascular (CV) events of stroke or heart attack 38 years later

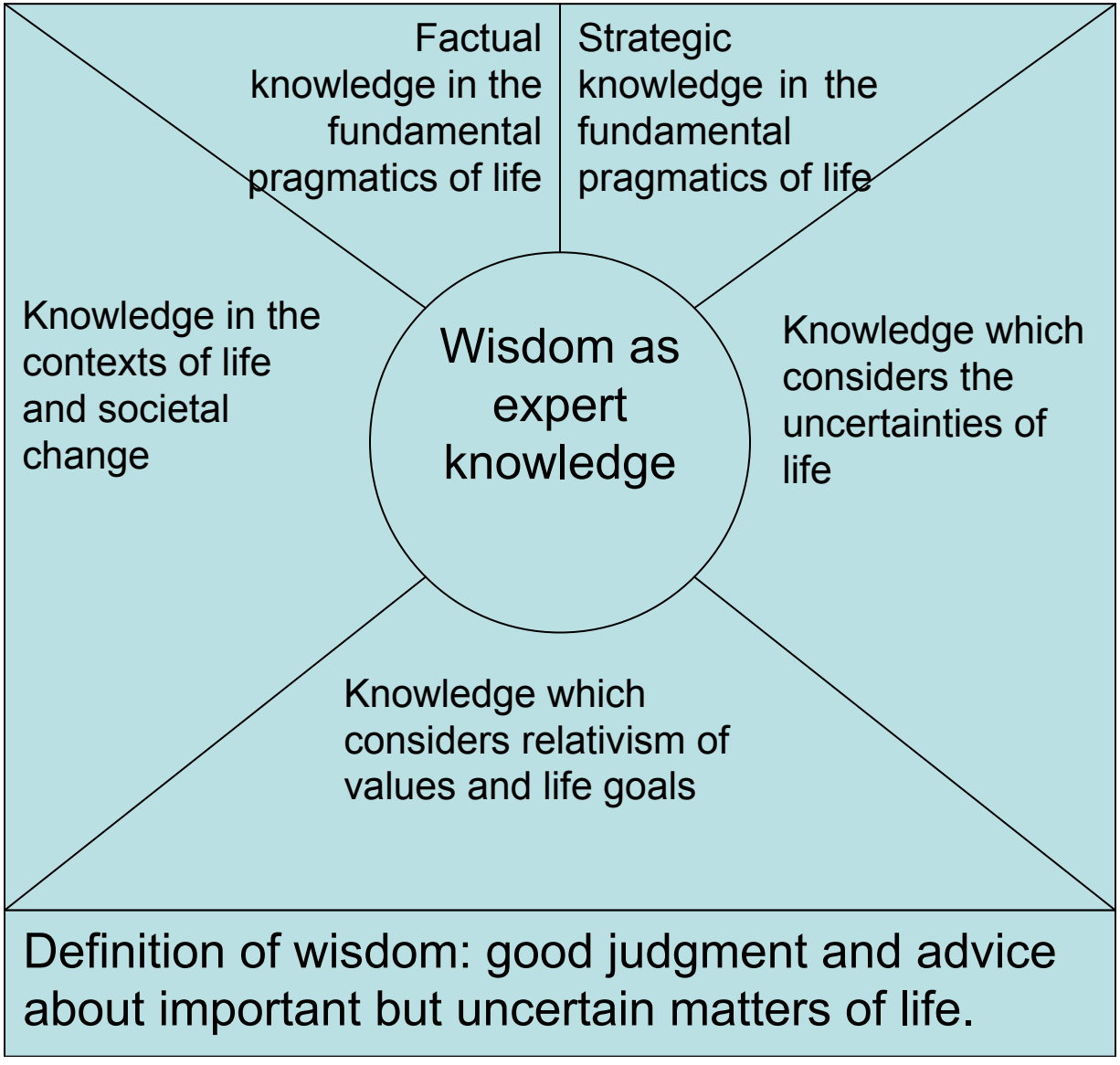
Socioemotional Selectivity Theory

Regardless of chronological age, when time in life is limited, people focus more on social goals related to emotional meaning and emotional satisfaction and less on those related to knowledge acquisition (e.g., Carstensen, Isaacowitz, & Charles, 1999)



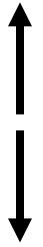
Courtesy of American Psychologist. Used with permission.

The Berlin model of wisdom as an expertise in the fundamental pragmatics of life



Socioemotional Selectivity Theory

- **motivations and goals set by temporal context**
- **time perceived as limited**



current emotions

novelty, information acquisition

- **emotion > non-emotion**
- **positive > negative emotions**

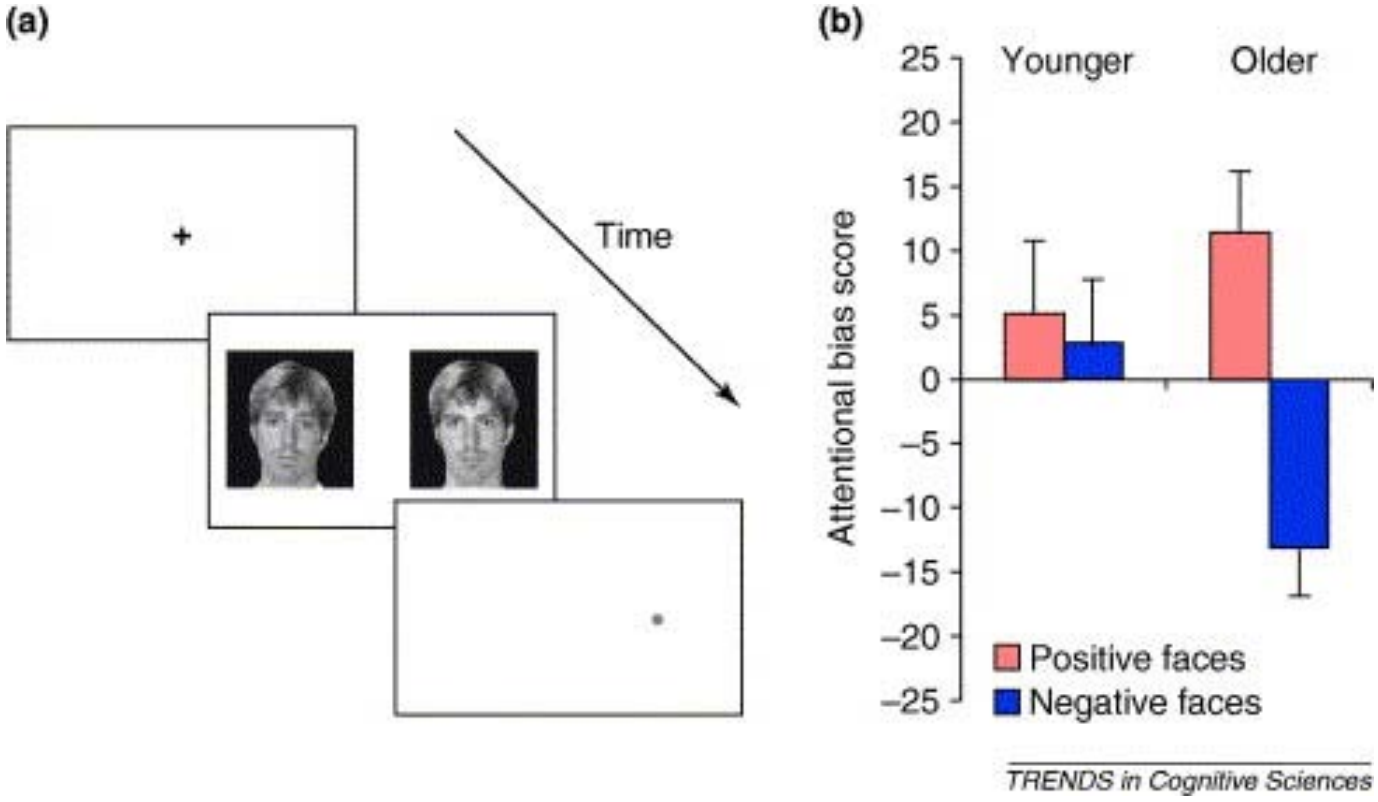
Positivity Bias in older age



Courtesy of Life-span Development Laboratory. Used with permission.

Advertisements used to the way age affects preferences and memories for products. While the photographs are the same, one slogan has emotional appeal and one has adventure appeal.

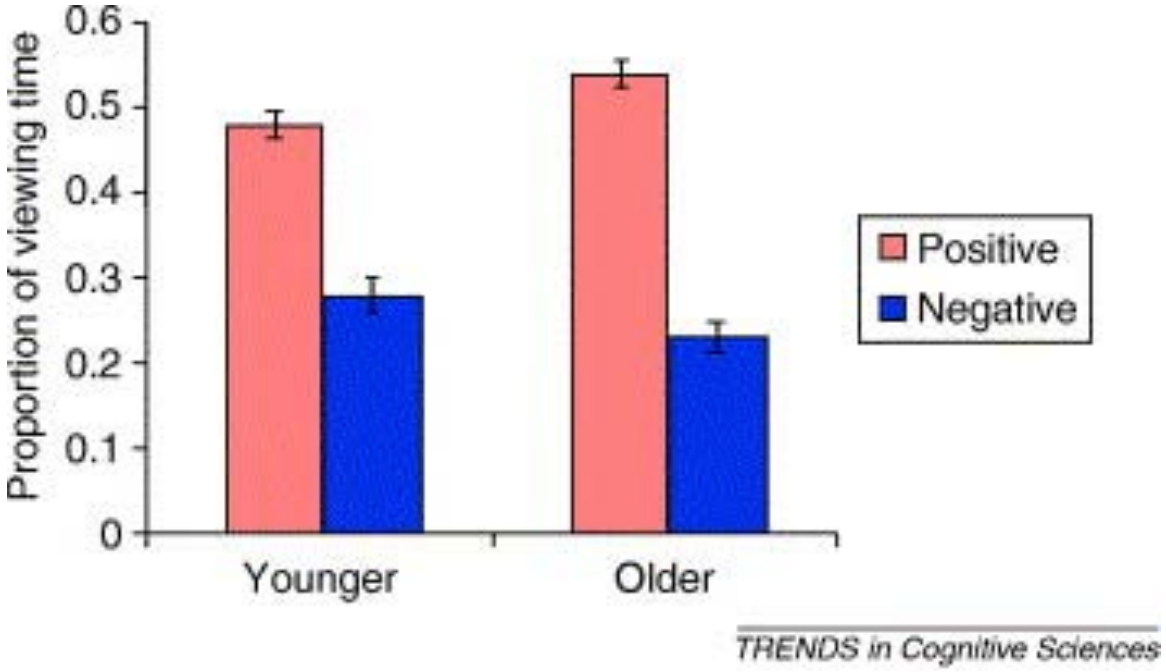
Carstensen, Science, 2006



Courtesy of Elsevier. Used with permission.

Figure 1. **(a)** The display in the dot-probe task. **(b)** Attentional bias scores of younger and older groups of adults. Positive scores indicate faster responses to dot appearing behind emotional faces than behind neutral faces. Older adults showed higher scores to positive faces and lower scores to negative faces than younger adults.

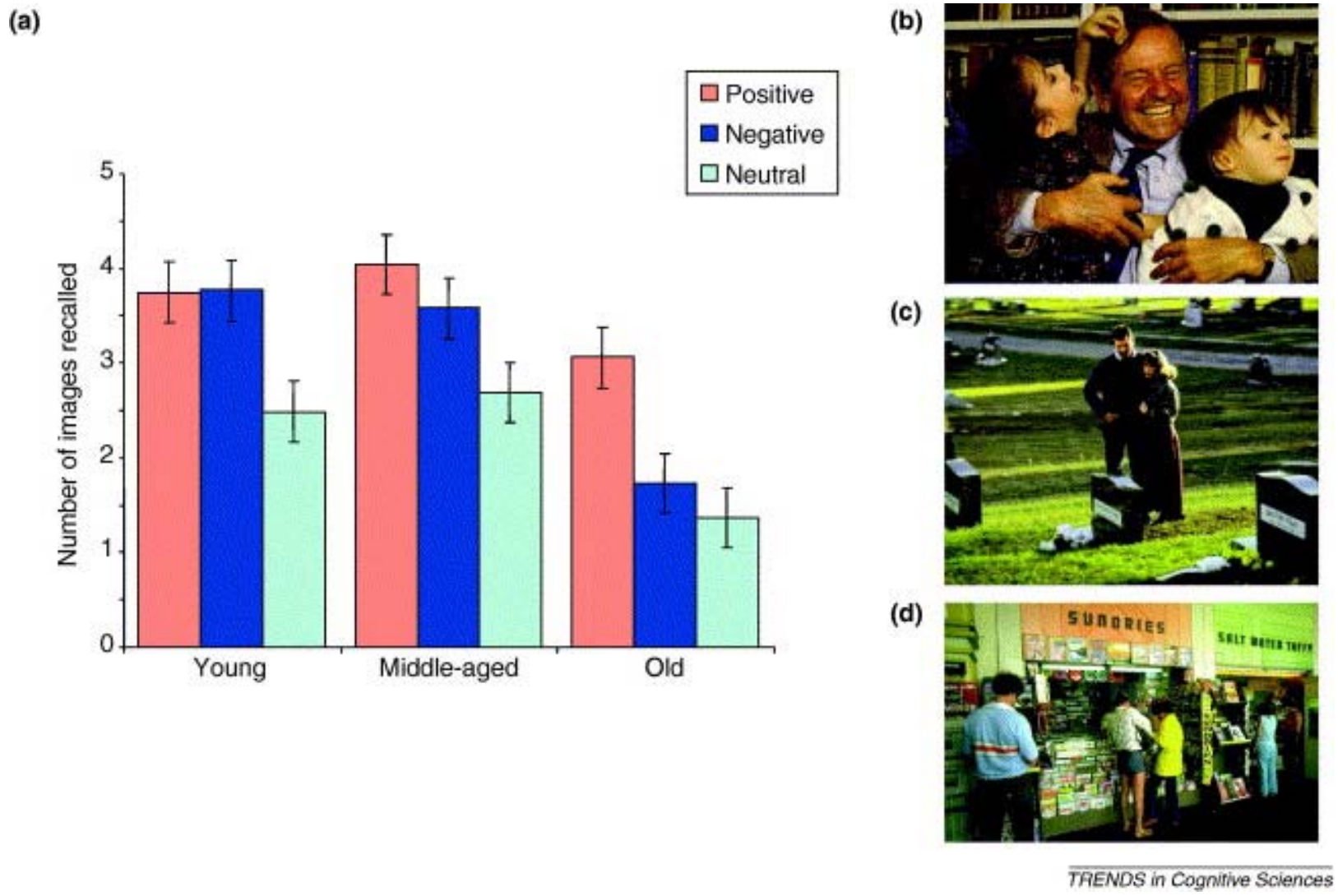
Mather & Carstensen, Trends in Cognitive Sciences, 2005



Courtesy of Elsevier. Used with permission.

Figure 2. Total viewing time of older and younger adults for positive and negative car option features, when asked to choose a car.

Mather & Carstensen, Trends in Cognitive Sciences, 2005



Courtesy of Elsevier. Used with permission.

Figure 3. (a) Total number of pictures recalled by younger (18–29 years old), middle-aged (41–53 years old), and older (65–80 years old) adults; examples of **(b)** positive, **(c)** neutral and **(d)** negative pictures seen in the experiment. [57]

Mather & Carstensen, Trends in Cognitive Sciences, 2005

EMPHASIS ON EMOTION

Age or Time?

- **moving towns**
- **early death**
- **inner city gangs**

temporal horizon

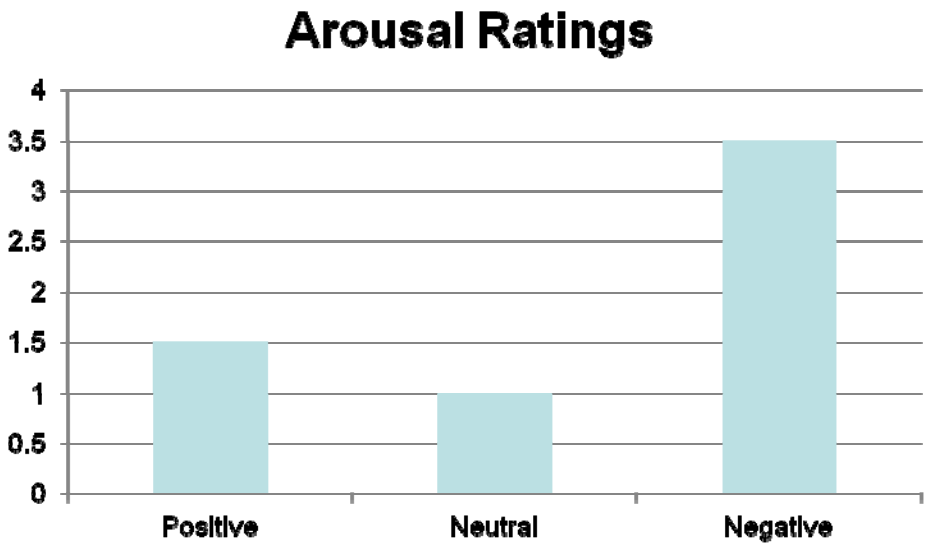
Memory for emotionally positive, negative, and neutral pictures



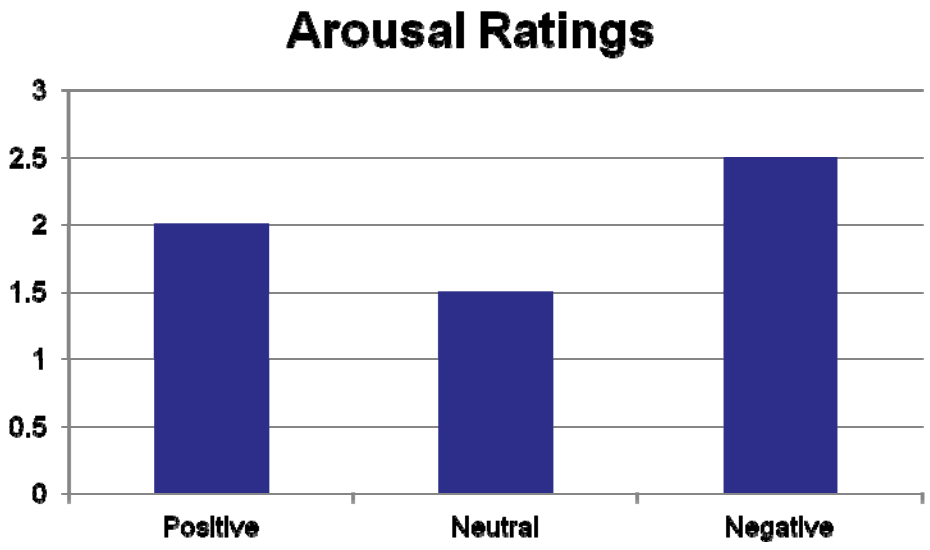





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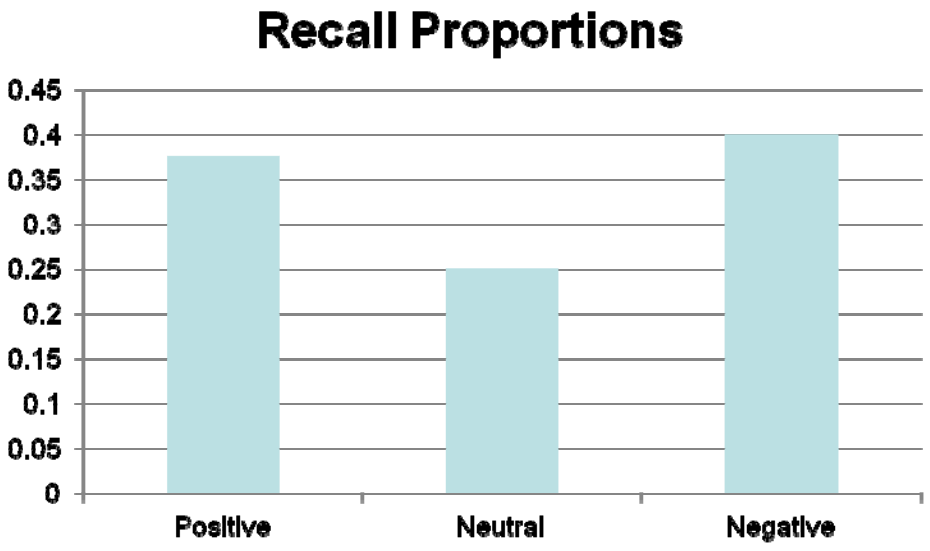


younger

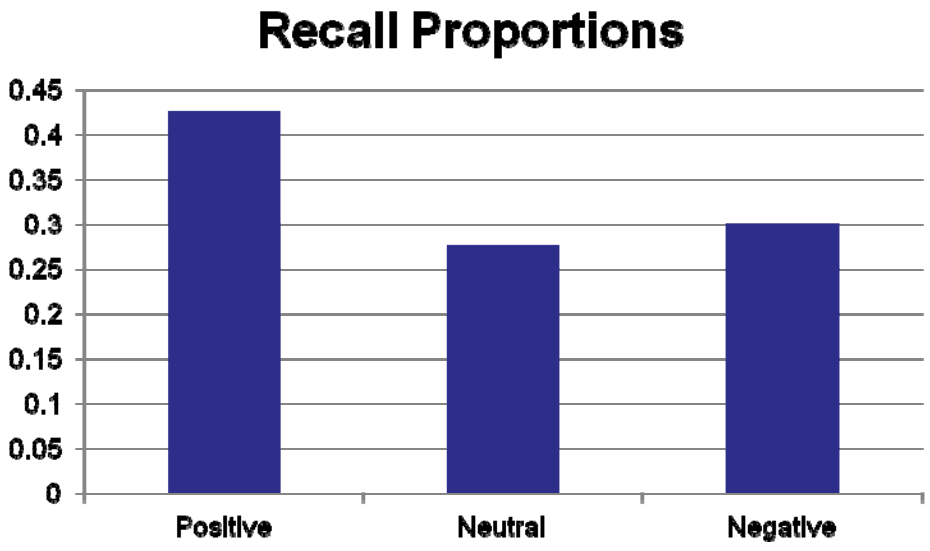


older

Recall Proportions

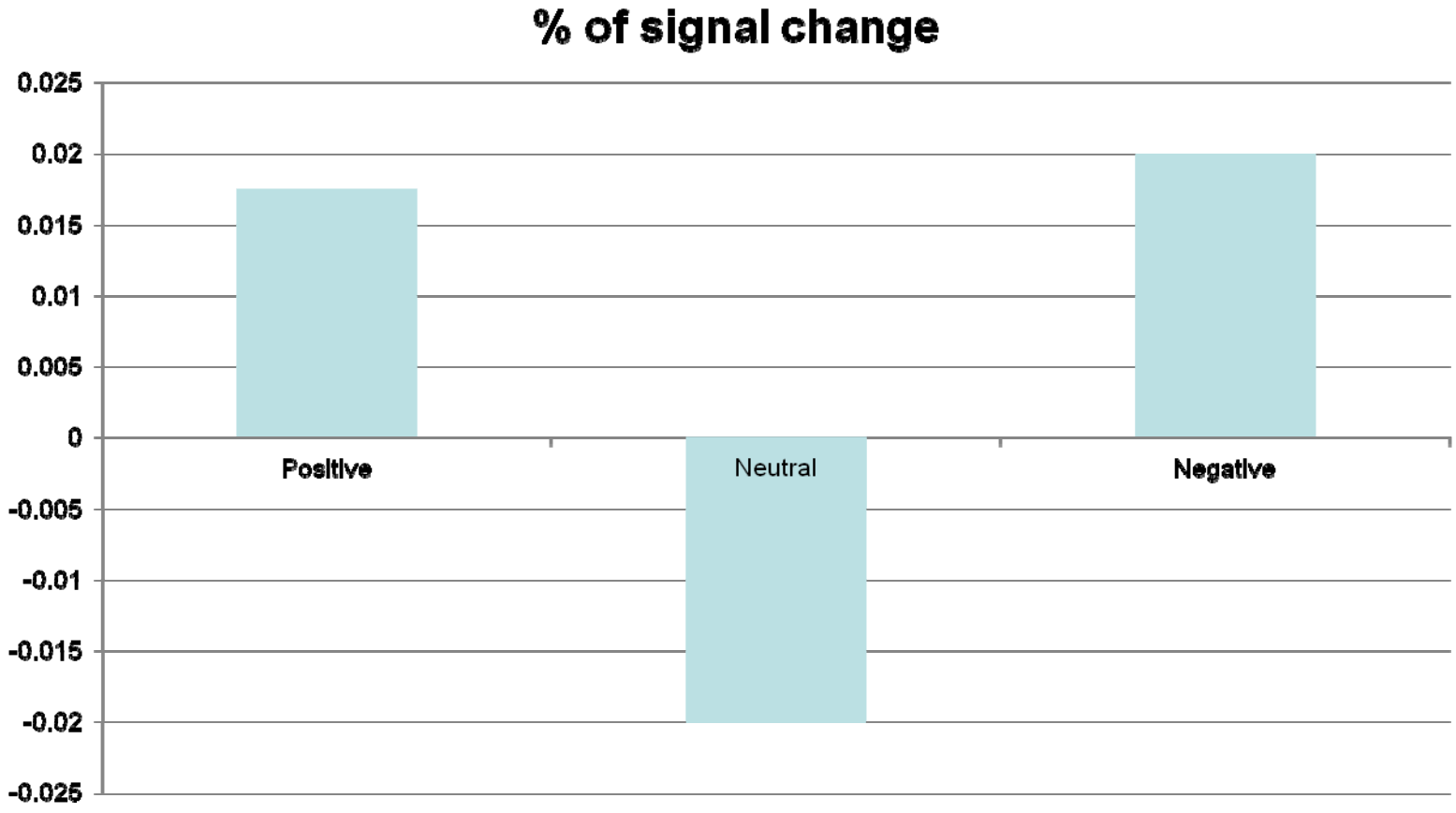


younger

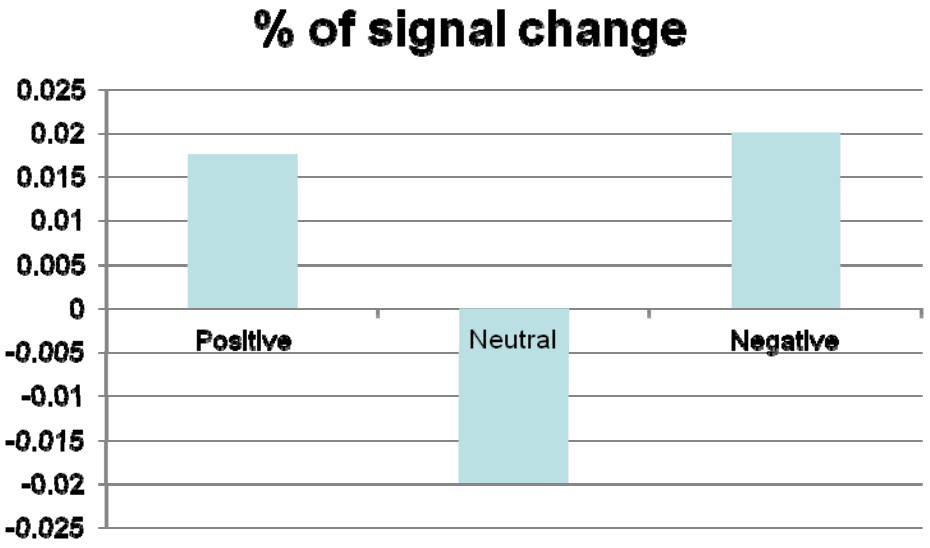


older

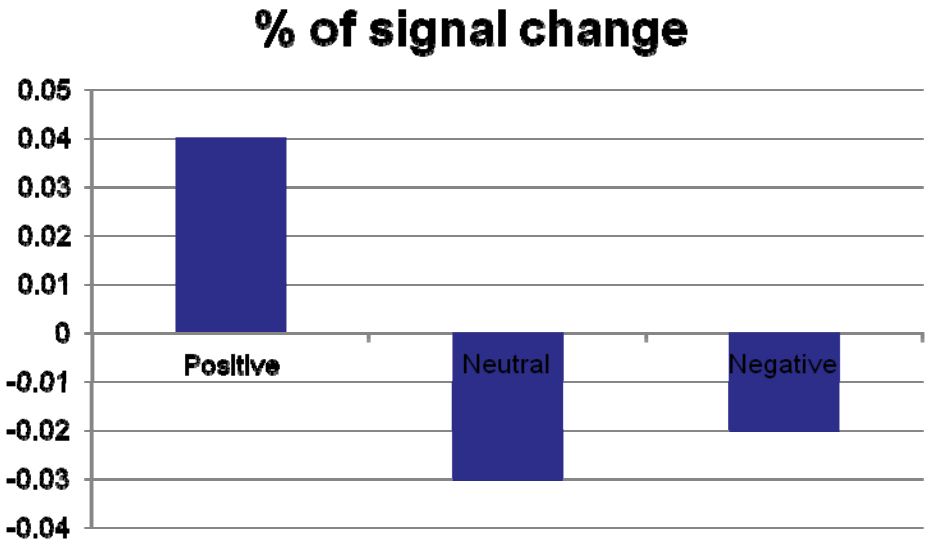
Amygdala Activity



Amygdala Activity

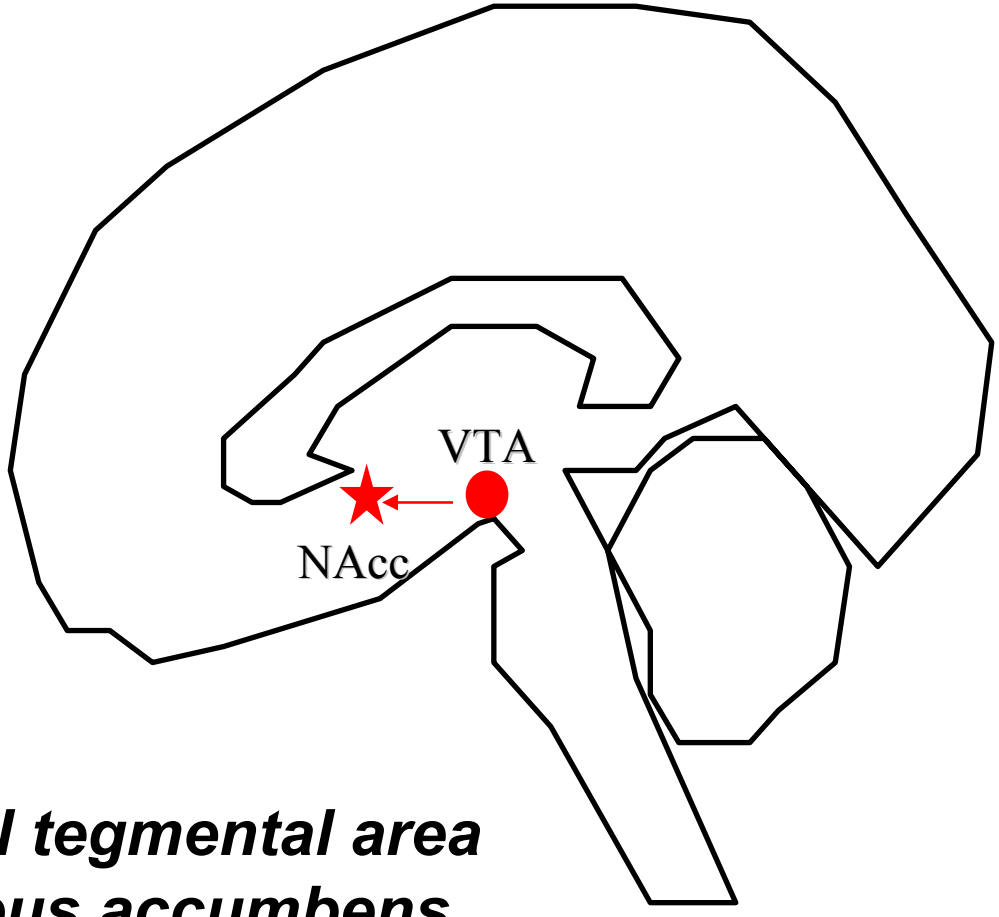


younger



older

Reward System:
Dopamine Projection Targets



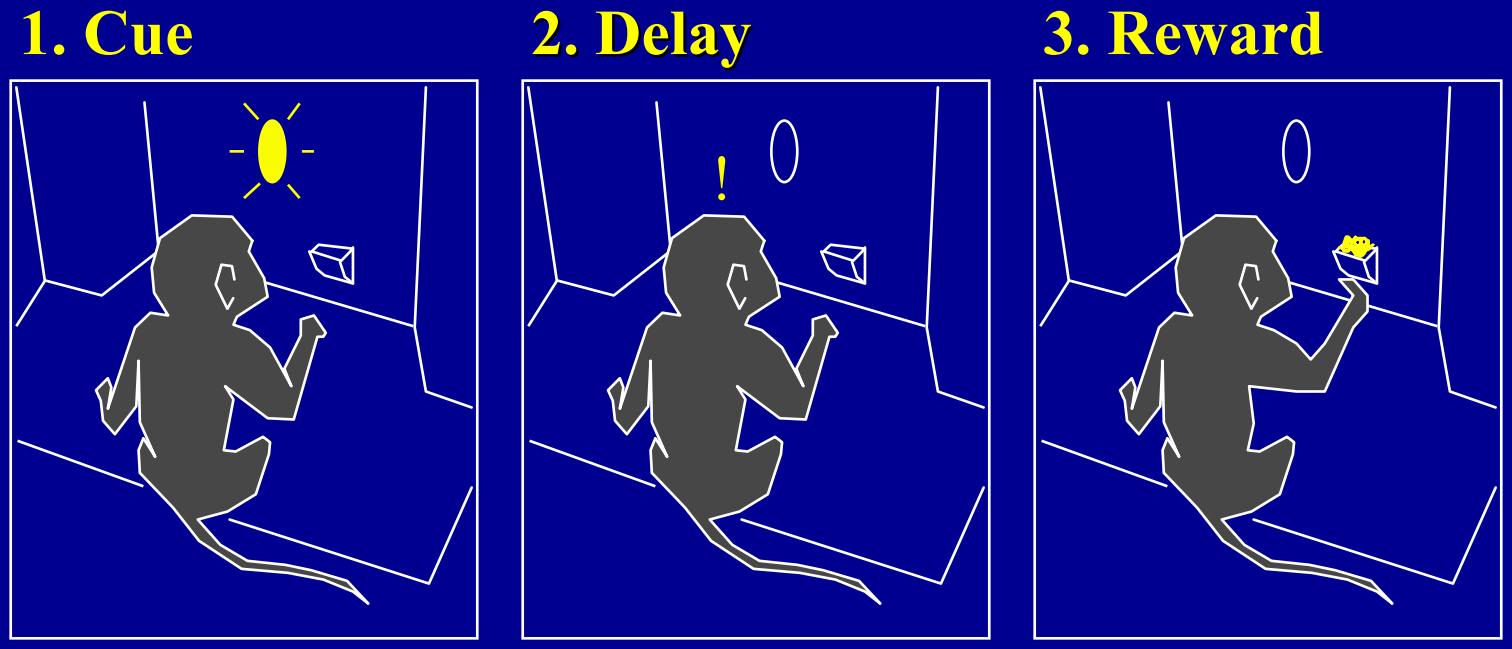
VTA = ventral tegmental area
NAcc = nucleus accumbens

Reward Anticipation

- DA from ventral tegmental area (VTA) to nucleus accumbens (NAcc)

- After learning, VTA cells respond to cue
 - Electrophysiologically (Shultz et al., 2000)
 - NAcc activation (Knutson et al., 2001)

Incentive delay in monkeys



Schultz W et al. (1998) *Neuropharmacology*, 37:421-429.

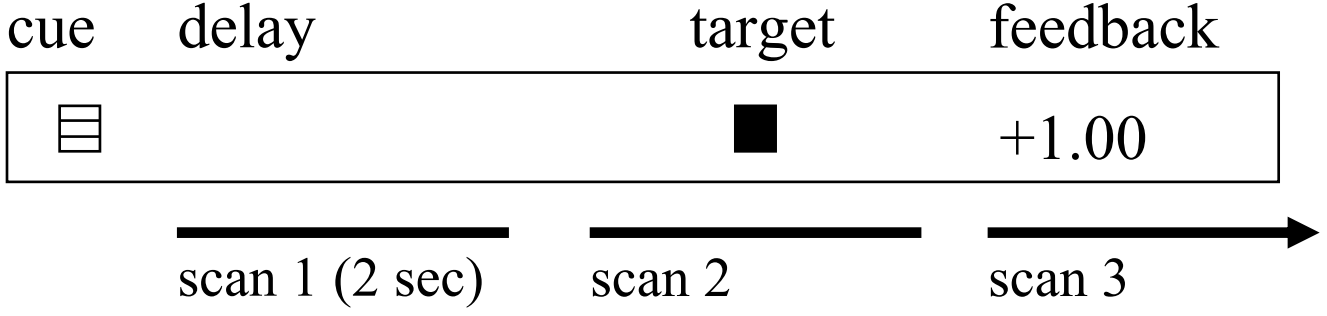
Monetary Incentive Delay Task

(1) See a ***cue*** (500 msec)

(2) Wait a variable ***delay*** (2-2.5 sec)

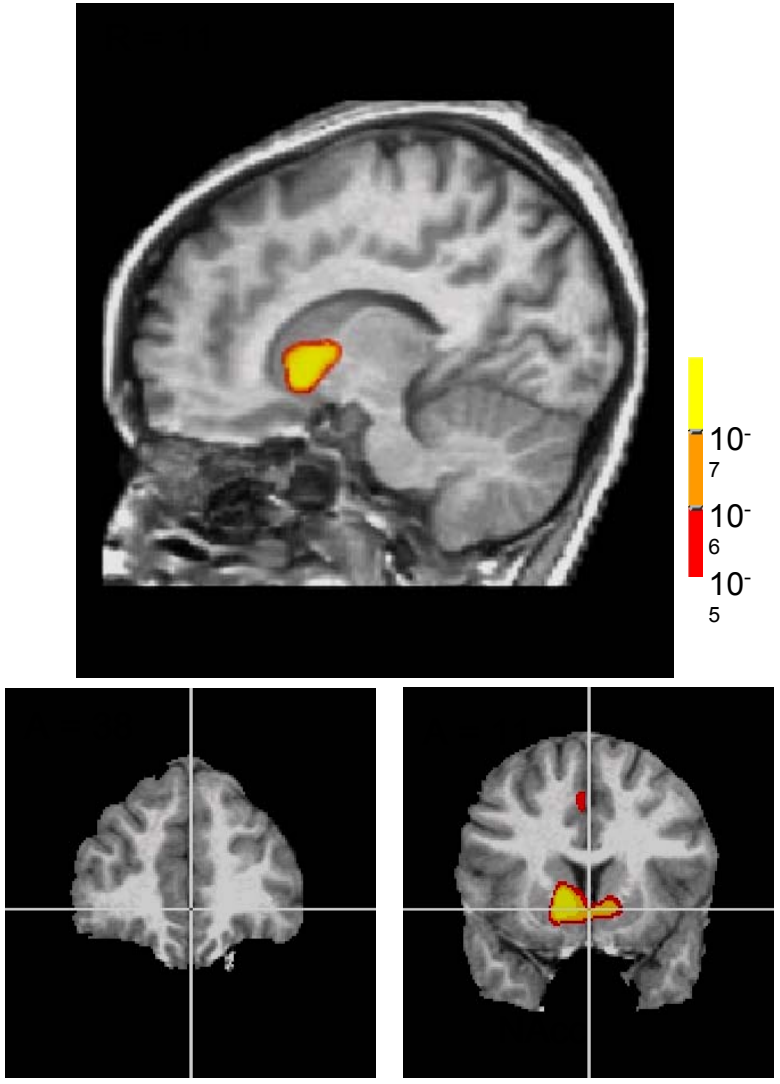
(3) Respond to a ***target*** with a button press (160-260 msec)

(4) View performance ***feedback*** (500 msec)



Knutson B et al. (2000) *NeuroImage*

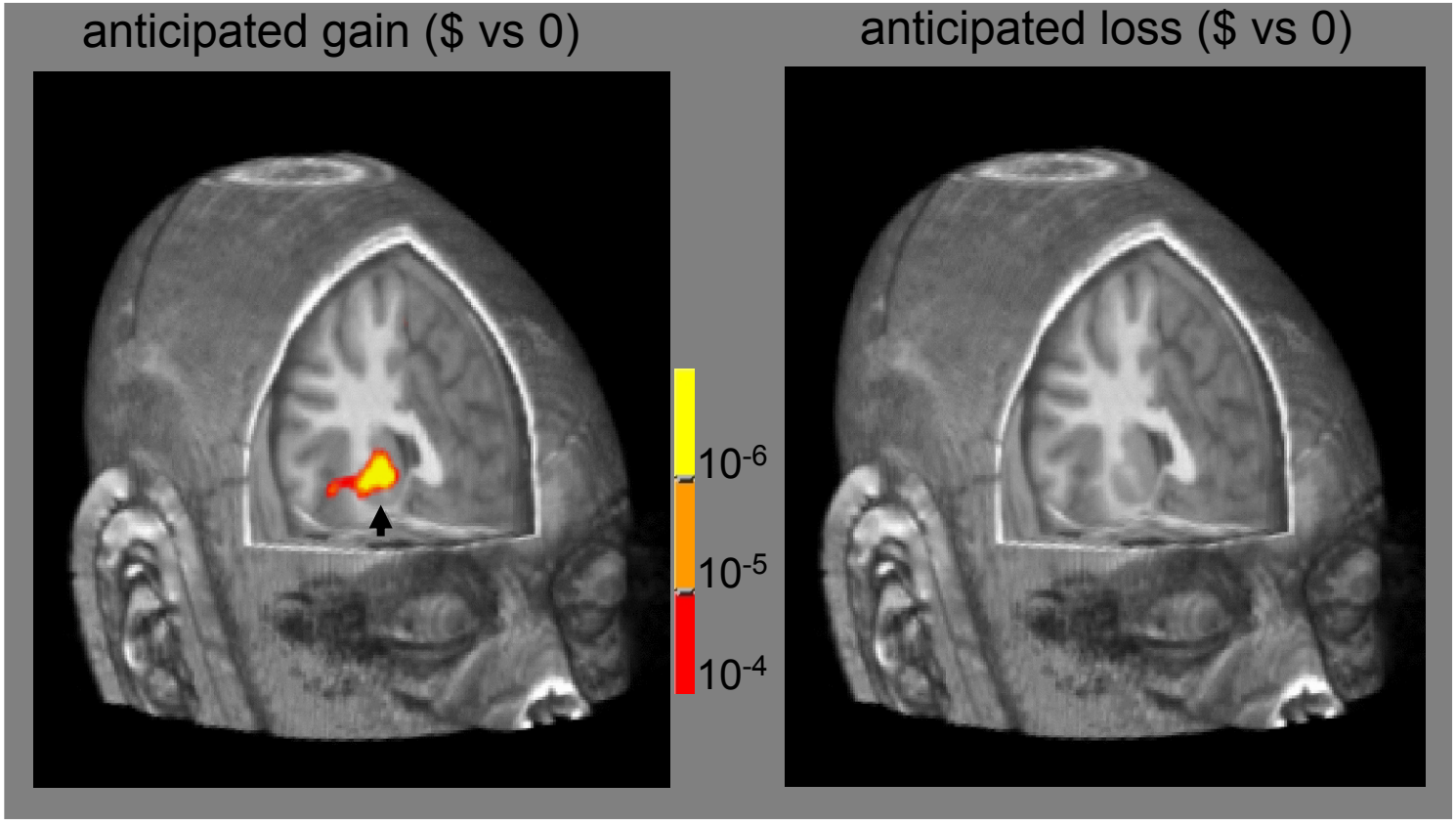
NAcc recruited by anticipation of responding for a reward versus nonreward



Courtesy of Brian Knutson. Used with permission.

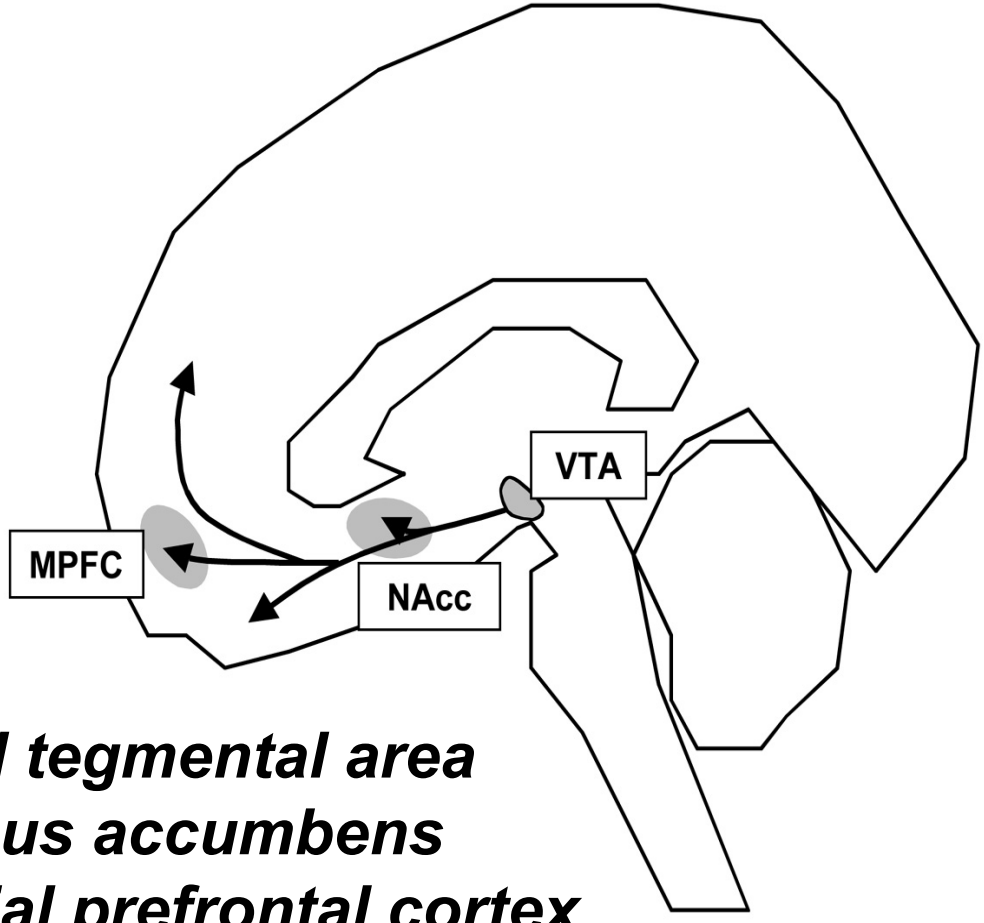
Knutson B et al. (2001) *J Neurosci*ence

Gain anticipation activates NAcc



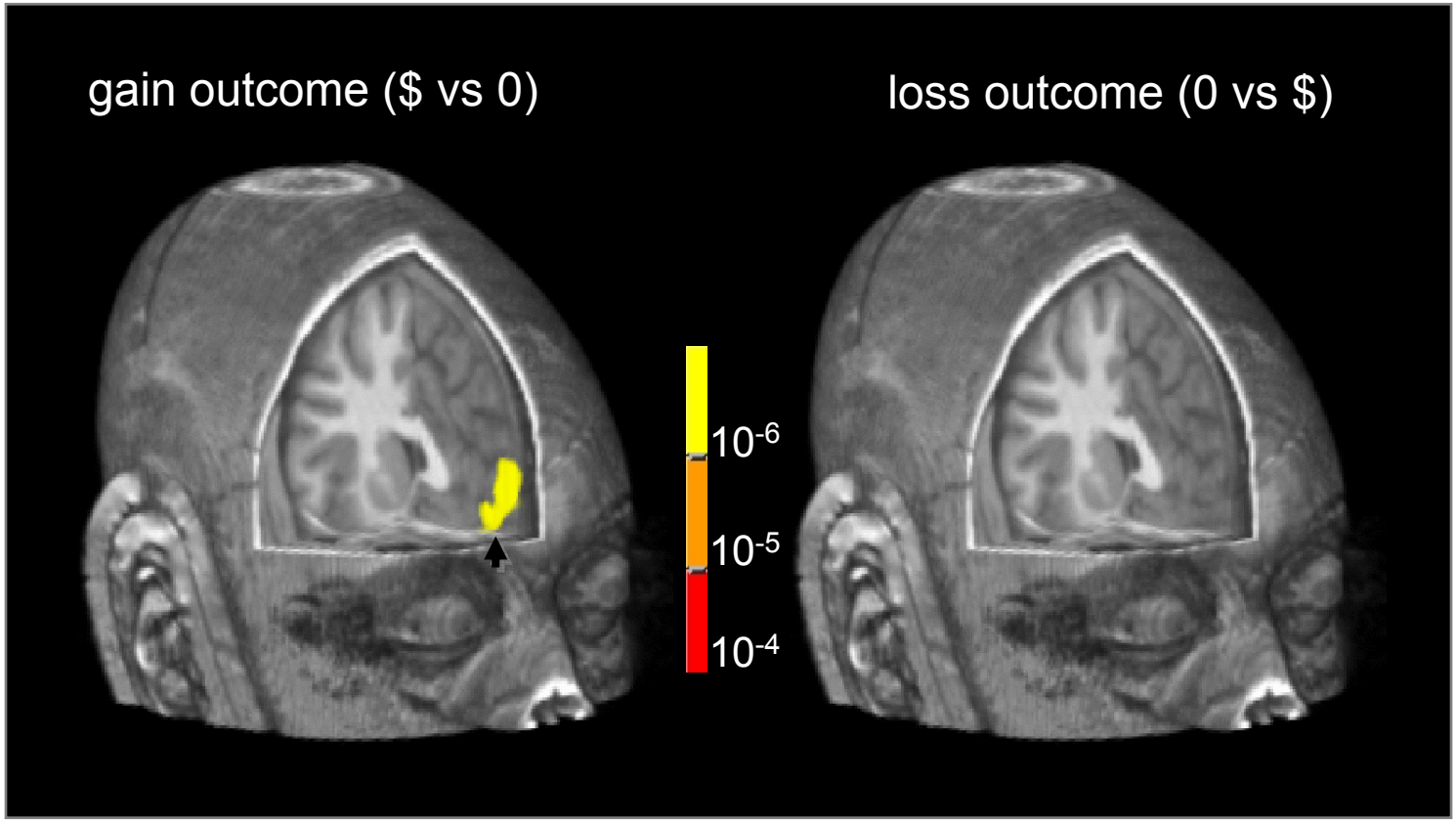
Courtesy of Brian Knutson. Used with permission.

Mesolimbic Dopamine Projections



VTA = ventral tegmental area
NAcc = nucleus accumbens
MPFC = medial prefrontal cortex

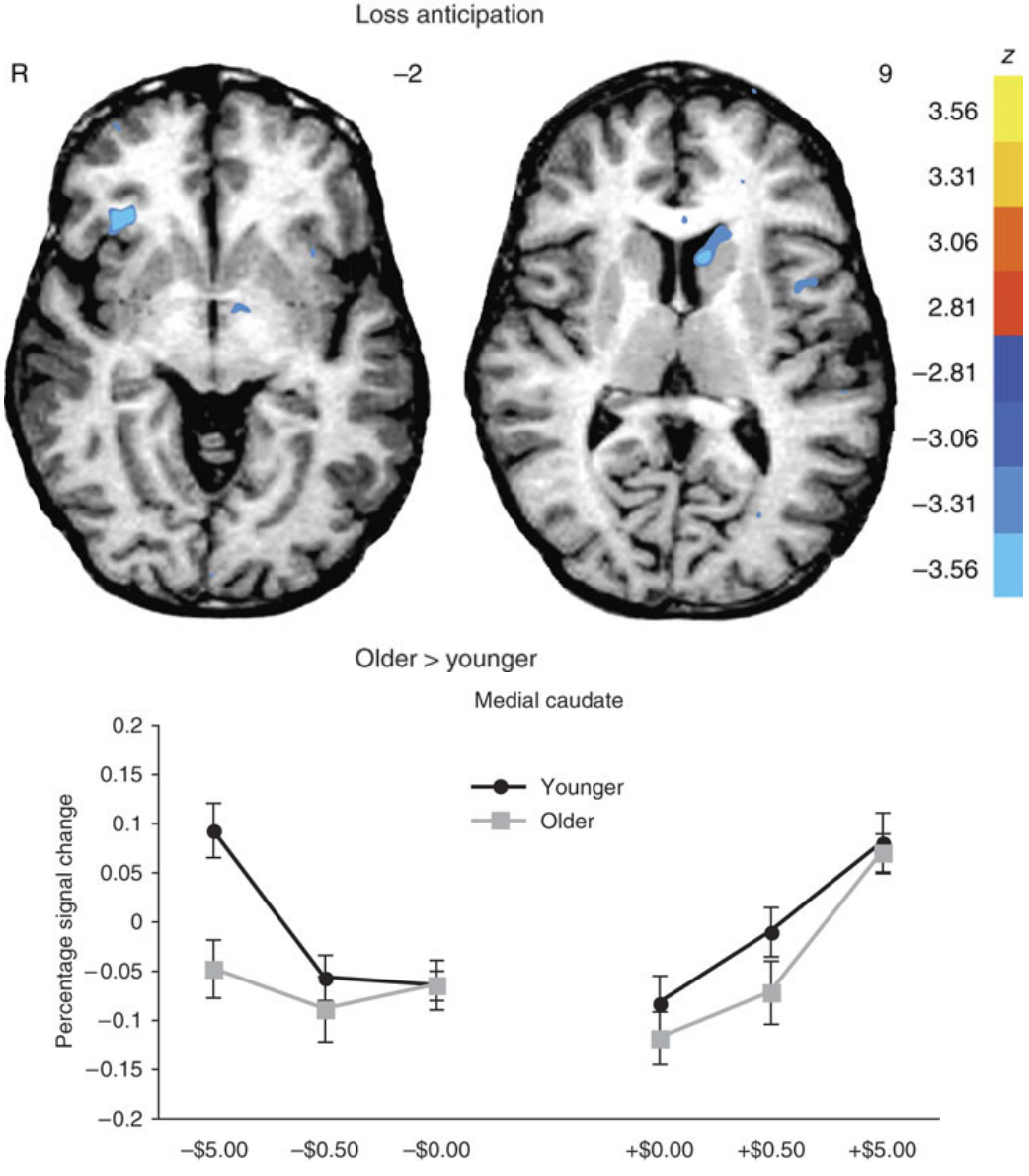
Gain outcomes activate MPFC



Courtesy of Brian Knutson. Used with permission.

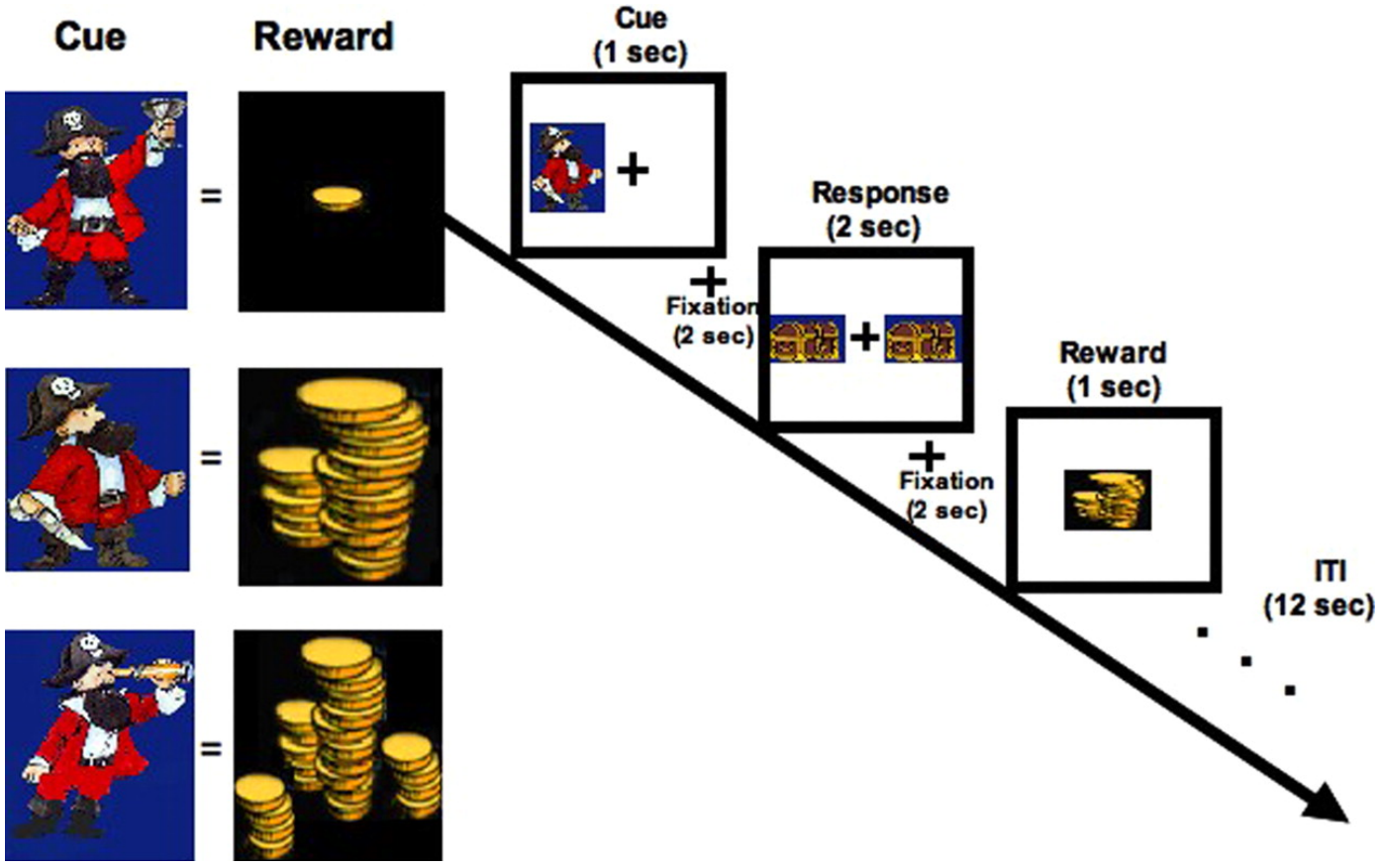
Knutson B et al. (2003) *NeuroImage*

OLDER PEOPLE LESS RESPONSIVE TO POTENTIAL LOSS BUT EQUALLY RESPONSIVE TO POTENTIAL GAIN



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Reward Behavioral Paradigm



Courtesy of A. Galván, et al. Used with permission.

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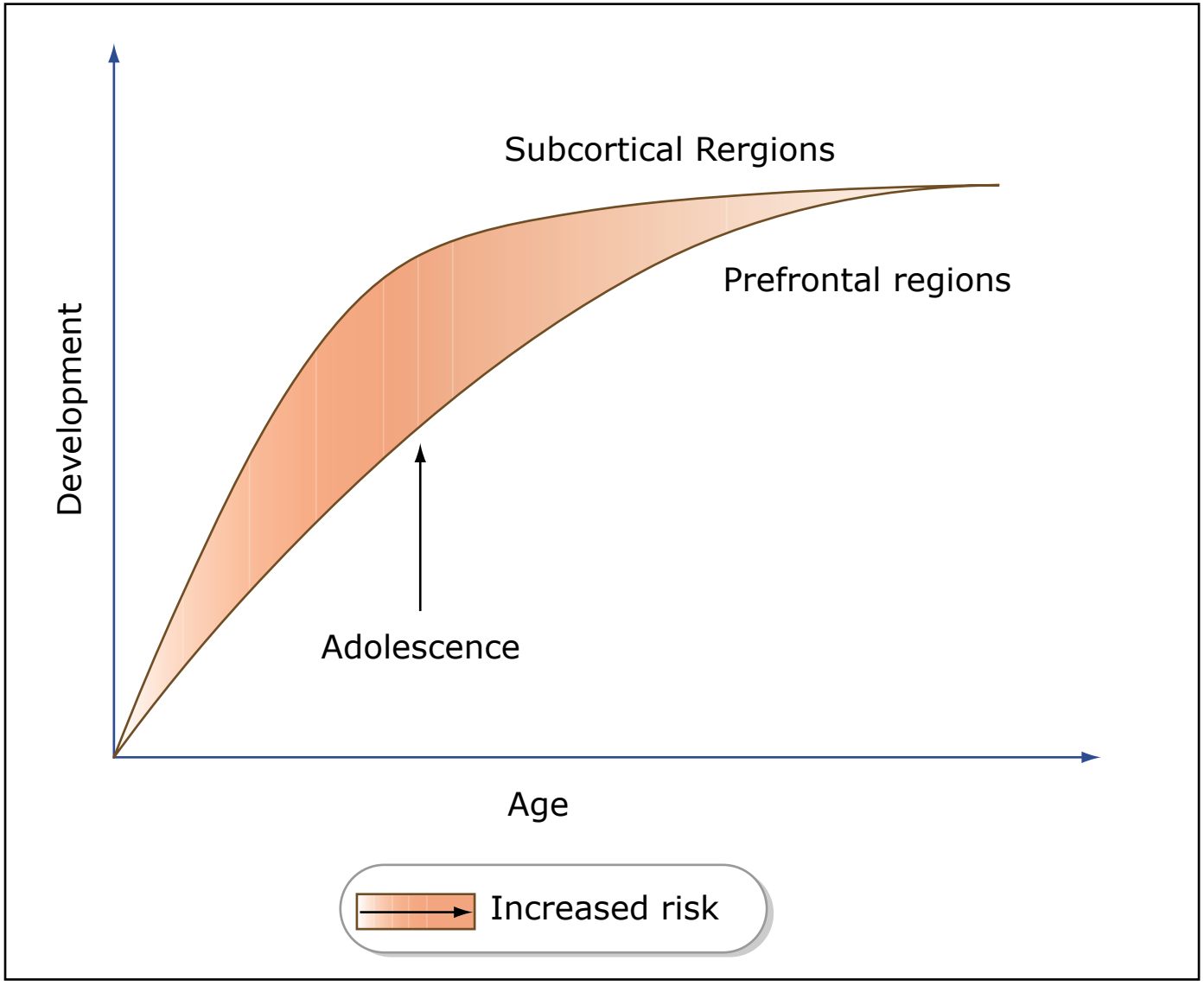


Image by MIT OpenCourseWare.

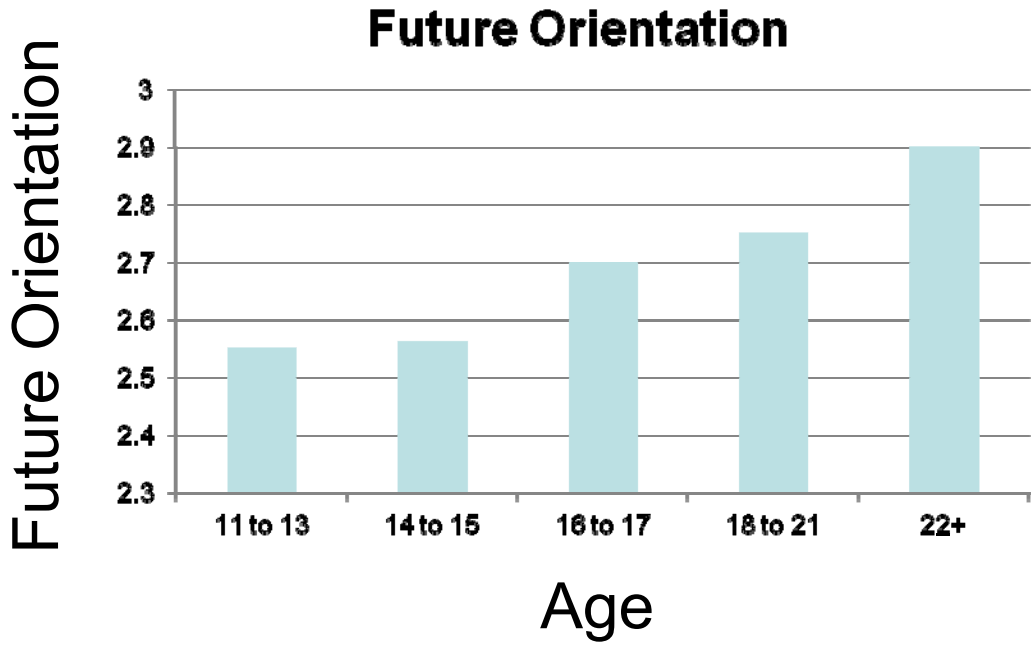
TABLE 2

Adolescent Exposure to Risks and Early Onset of Risk-Taking Behavior

Risk/behavior	Data
Alcohol	40% of adult alcoholics report having initial alcoholism symptoms between the ages of 15 and 19.
Car accidents	Between the ages of 16 and 20, both sexes are at least twice as likely to be in accidents than are drivers between the ages of 20 and 50. These accidents are the leading cause of adolescent death.
Gambling	Pathological or problem gambling is found in 10% to 14% of adolescents, and gambling typically begins by age 12.
Sexual activity	Adolescents are more likely than adults to engage in impulsive sexual behavior, to have multiple partners, and to not use contraception. Younger teens (12–14 years) are more likely to engage in risky sexual behavior than are older teens (16–19 years).
STDs	Annually, 3 million adolescents contract a sexually transmitted disease. HIV infection is the seventh leading cause of death among 13- to 24-year-olds.

Note. Data sources include Bachanas et al. (2002); Chambers & Potenza (2003); Chambers, Taylor, & Potenza (2003); and Turner & McClure (2003).

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Future Orientation
Future Orientation
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
11 to 13
14 to 15
16 to 17
18 to 21
22+
Age

Creating False/Illusory Memories

(sweet) **- associates**

sour
candy
sugar
bitter
good
taste
tooth
nice
honey
soda
chocolate
heart
cake
tart
pie

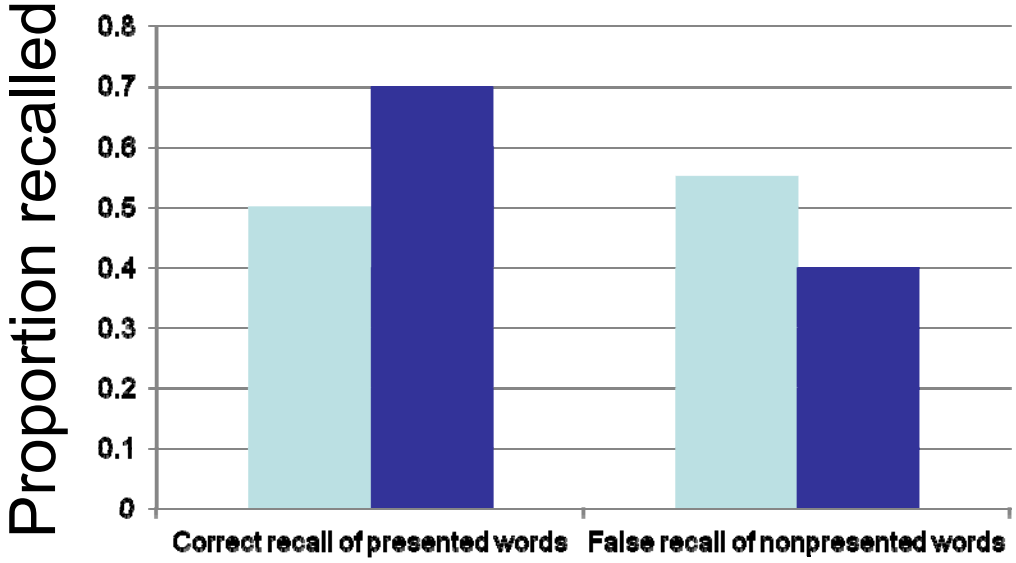
recall/recognition

false lure

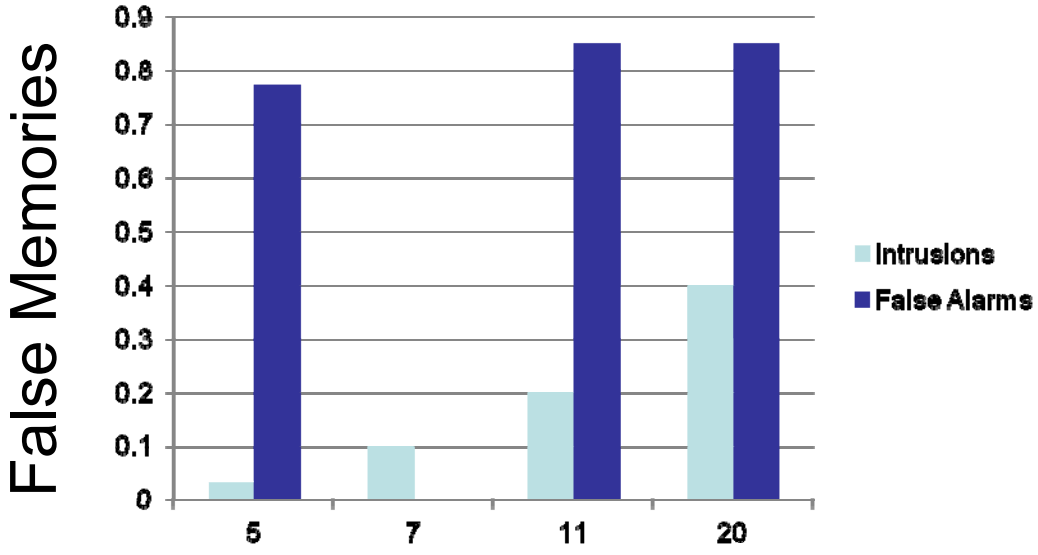
sweet

veridical details
vs.
essential gist

Older Adults Have More False Memories

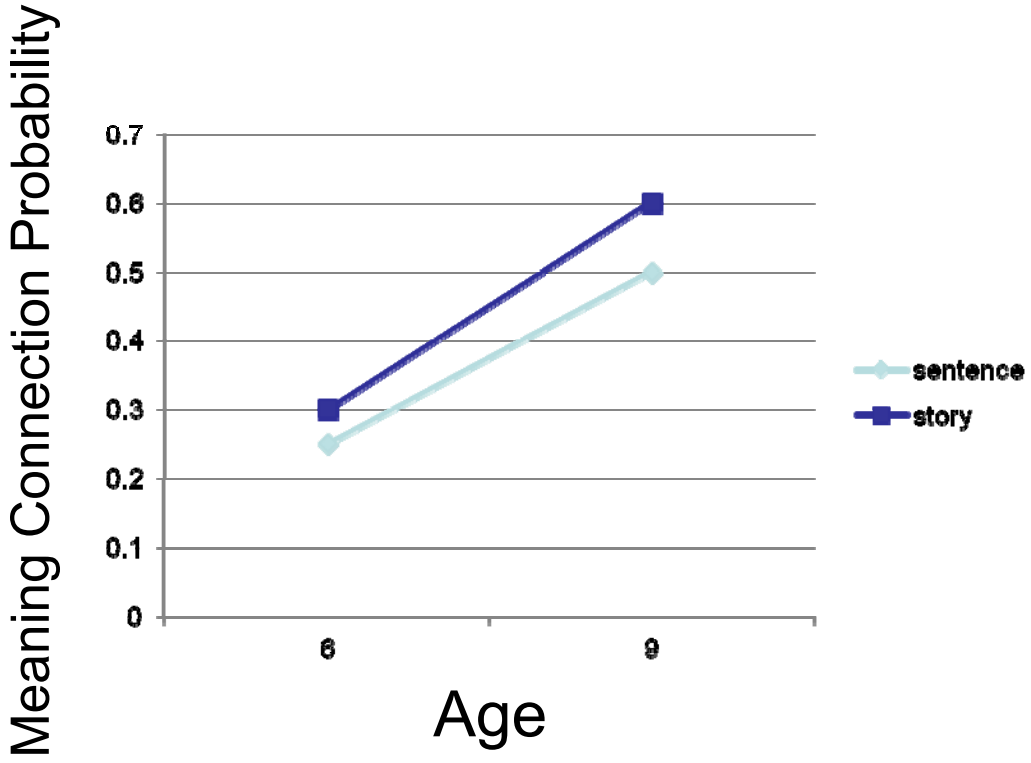


Children Have Fewer False Memories Than Adults

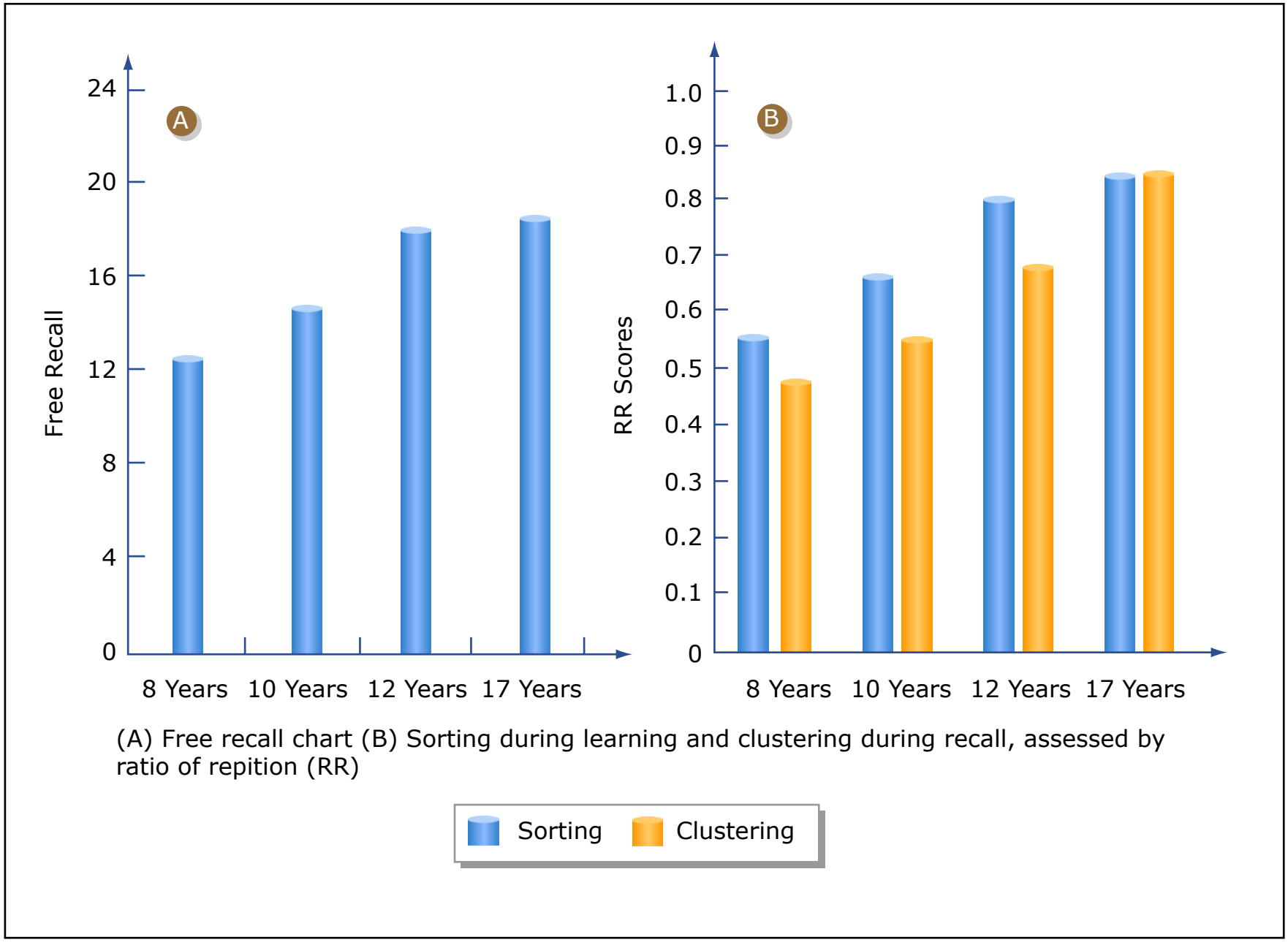


Intrusion = False Memory

Developmental Increase in Connecting Ideas Across Words in a Sentence or Sentences in a Story



Greater Conceptual Organization of Memory in Development



(A) Free recall chart (B) Sorting during learning and clustering during recall, assessed by ratio of repition (RR)

Image by MIT OpenCourseWare.

Physical and Social Transitivity

- ***physical transitivity***

 line A longer than line B

 line B longer than line C

 is line A longer than line C?

- ***social transitivity***

 person A is a friend with person B

 person B is a friend with person C

 is person A a friend with person C?

Physical and Social Transitivity

Grade	*physical transitivity*	*social transitivity*
1	.70	.33
2	.75	.50
3	.82	.58
4	.95	.71

Logic vs. Experience (gist)

Framing Heuristic –
Risk Averse for Gains, Risk Taking for Losses

If Program A is adopted, 200 people will be saved.

(72%) - Lives saved

If Program B is adopted, there is a one-third probability that 600 people will be saved, and a two-thirds probability that no people will be saved.

Which Program do you favor?

If Program A is adopted, 400 people will die.

(22%) - Lives lost

If Program B is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.

Which Program do you favor?

Younger Children Have Less Loss Aversion Than Older Children & Adults

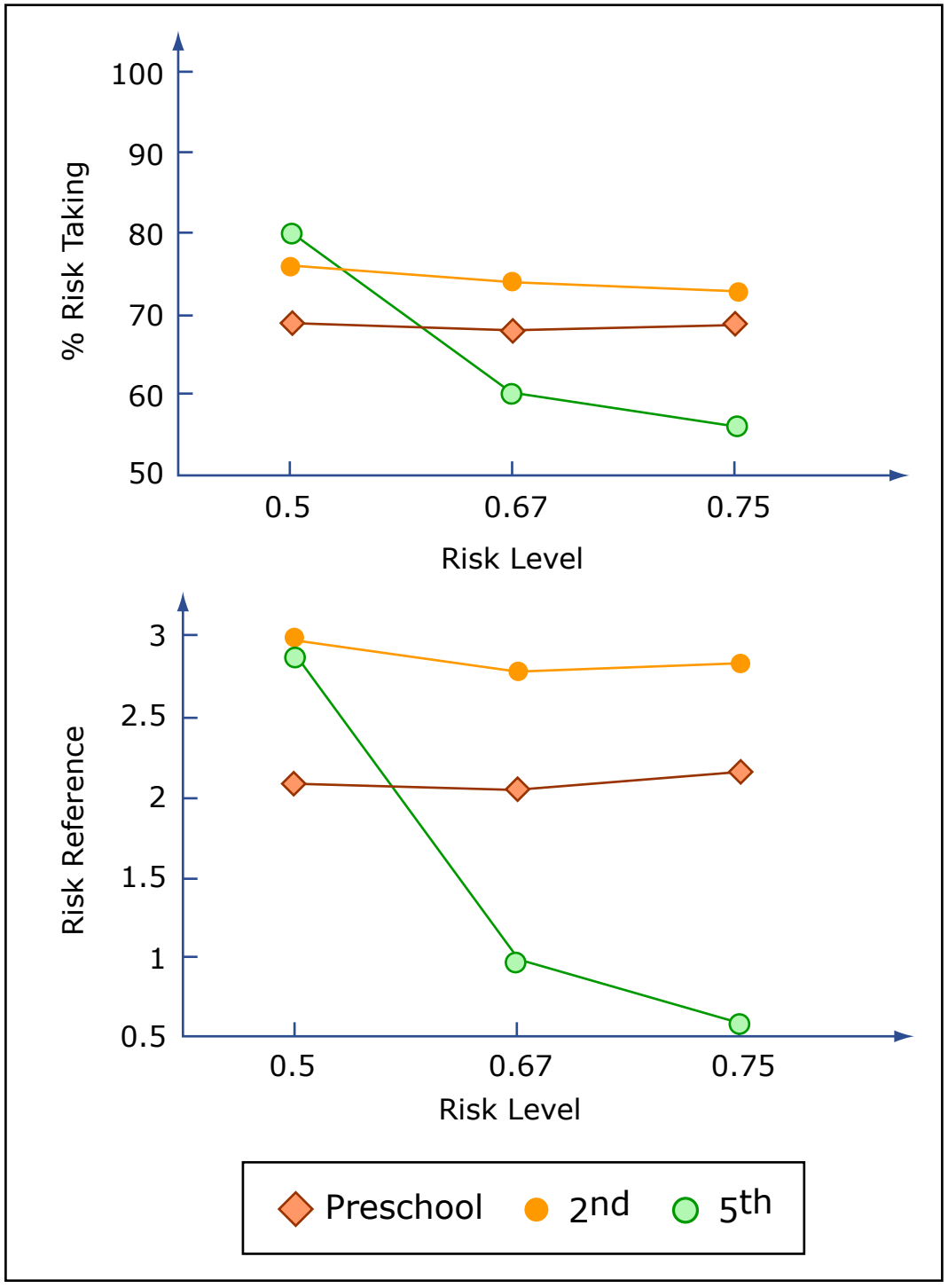


Image by MIT OpenCourseWare.

Adolescence

Do adolescents have the same cognitive abilities as adults?

Death penalty for teenage criminals?

Choices

Swim with Sharks?

adult – gist – bad idea, you could die

adolescent – weigh the factors of gain and loss

Have Unprotected Sex?

adult – gist – bad idea, STD, HIV, you could die

adolescent – weigh the factors of gain (sex is fun, a sure thing) and loss (what are the odds I will get infected or die from a single sex act?)

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9.00SC Introduction to Psychology
Fall 2011

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STRESS

John Gabrieli

9.00

STRESS

What stresses you?

STRESS

What stresses you?

- exams, grades
- deadlines
- traffic
- family relationships
- life after college, etc., etc.

STRESS

What stresses you?

- exams, grades
- deadlines
- traffic
- family relationships
- life after college, etc., etc.

What does not stress you?

STRESS

What stresses you?

- exams, grades
- deadlines
- traffic
- family relationships
- life after college, etc., etc.

What does not stress you?

- being eaten or eating another being

STRESS

What stresses a zebra?

(Robert Saplosky, *Why Zebras Don't Get Ulcers)*

STRESS

What stresses a zebra?

serious physical injury

predators (lions)

starvation

STRESS

- psychological and physiological response to a stimulus (*stressor)* that alters the body's equilibrium

STRESS

	Acute	*Chronic*
Physical	injury	hunger, cancer
Psychological	deadline	chronic work pressure
Social	humiliation	chronic isolation

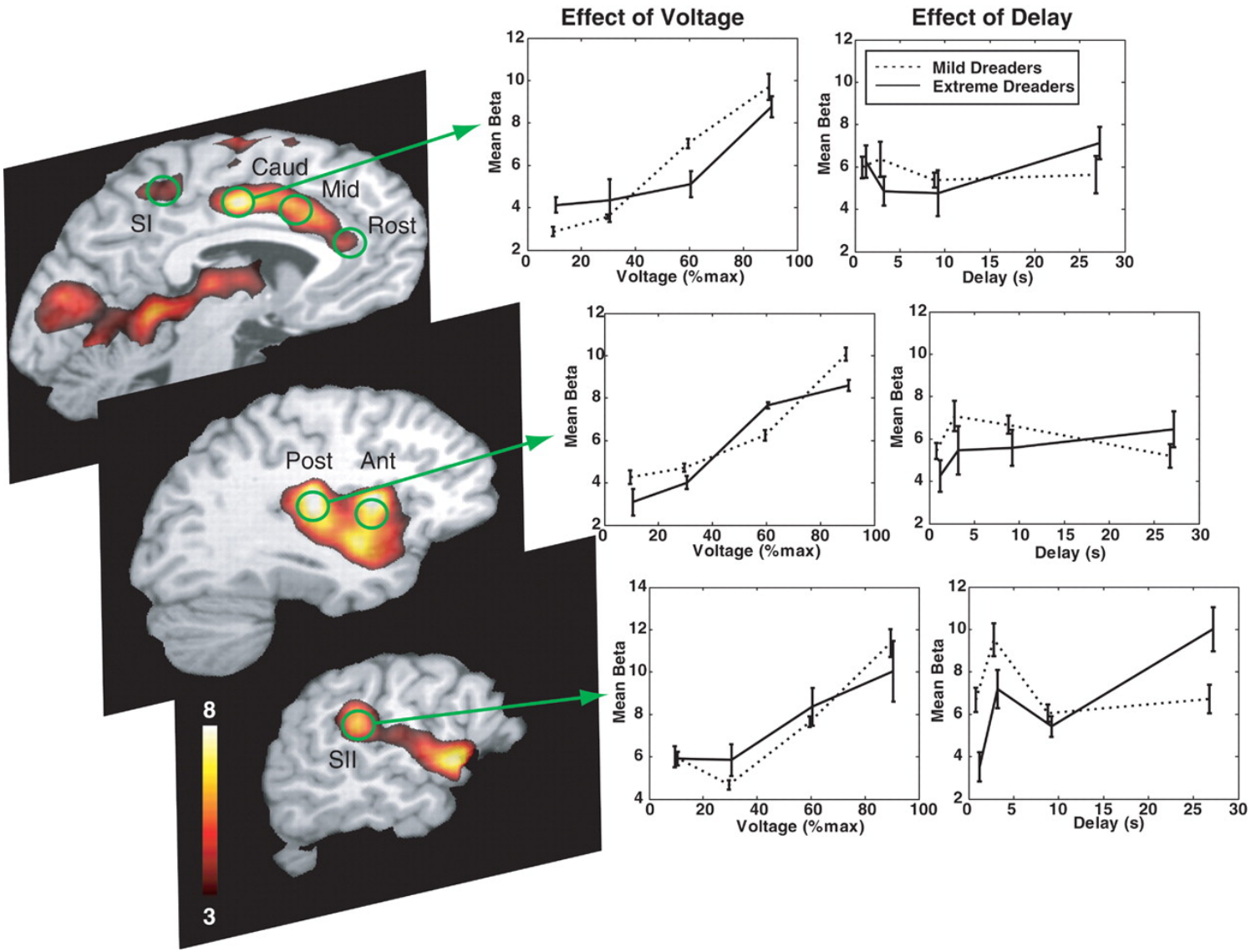
STRESS

- for animals, stress is often acute, physical, responsive
- for people in industrial society, stress is often chronic, psychosocial, anticipatory

Neurobiological Substrates of Dread

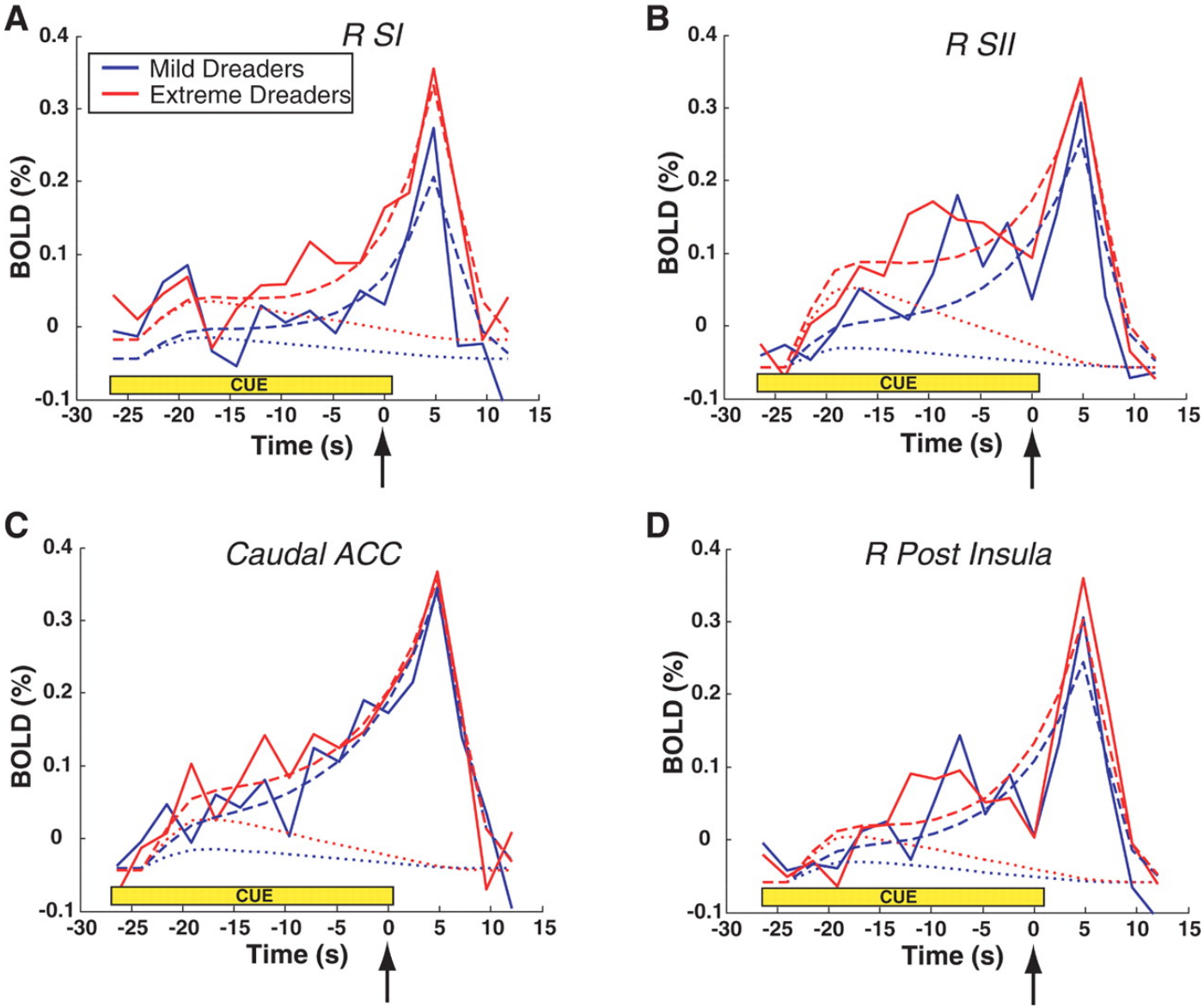
- Berns 2006, *Science*
- fMRI and waiting for a cutaneous electrical shock to foot
- each trial starts with information about voltage level and amount of time
- at first 100% of trials had voltage
- choice phase, e.g., 90% voltage in 3 secs or 60% voltage in 27 secs
- some people prefer more voltage now than to wait for shock (extreme dreaders)

More Voltage (Pain) Associated with Greater Brain Activation



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Extreme Dreaders Had Earlier & More Sustained Activation Between Cue and Shock



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Mortality

- 1900 ?

Mortality

- 1900 - infectious diseases & childbirth
 - pneumonia
 - tuberculosis
 - influenza (1918 - more than WWI)
 - childbirth (young women)
- 2007?

Mortality

- 1900
 - pneumonia
 - tuberculosis
 - influenza (1918 - more than WWI)
 - childbirth (young women)

- 2007 - cumulative damage
 - heart disease
 - cancer
 - cerebrovascular disorders

STRESS

- Hans Selye - 1930s - insightful scientists, not so good at handling rats

Colleague extracted ovarian chemical - what does it do? - Selye injected rats daily - dropped them, ran around - several months later - peptic ulcers, enlarged adrenal glands, shrunken immune tissue - also in control rats

- exposed rats to many stressors, all had the same result

STRESS

- The *Stress Response* is similar to a broad array of stressors

- if stressors go on for too long, they make you sick

STRESS & AUTONOMIC NERVOUS SYSTEM

- *Sympathetic nervous system*
 - brain to spine, organs, blood vessels, sweat glands, muscles and hairs (goosebumps)
 - emergency, arousal, activation
 - four Fs - flight, fright, fight, and sex
 - releases epinephrine/norepinephrine (adrenaline/noradrenaline)
- *Parasympathetic nervous system*

 sleep, eating, relaxation

STRESS & AUTONOMIC NERVOUS SYSTEM

	Sympathetic	*Parasympathetic*
Heart	speeds up	slows down
Blood	to muscles	from muscles

STRESS & HORMONES

- hypothalamus

 releases CRH (corticotropin releasing hormone) to anterior pituitary

- anterior pituitary (15 sec)

 releases adrenocorticotropic hormone (ACTH) into blood

- adrenal glands (kidney) (few minutes)

 release glucocorticoids (steroids) (cortisol)

The Stress Response and its Consequences

Adaptive Stress-Response

- Mobilization of energy
- Increased cardiovascular tone
- Suppression of digestion
- Suppression of growth
- Suppression of reproduction
- Suppression of immune system
- Sharpening of cognition

Stress-Related Disorder

- Myopathy, fatigue, diabetes
- Stress-induced hypertension
- Ulceration, colitis
- Psychogenic dwarfism
- Amenorrhea, impotency, loss of libido
- Increased disease risk
- Neuron death

The Stress Response and its Consequences

Adaptive Stress-Response

- Increased cardiovascular tone
- Increase heart rate
- Increase blood pressure to muscle (and brain) away from digestive system
- Decrease kidney function to keep water
- Void the bladder

Stress-Related Disorder

- Stress-induced hypertension
- Ventricular hypertrophy
 - (top predictor of cardiac arrest controlling for age)
- Damage to arteries
 - Plaque formation
 - Damaged inflamed blood vessels



This image is in the public domain.

The Stress Response and its Consequences

Adaptive Stress-Response

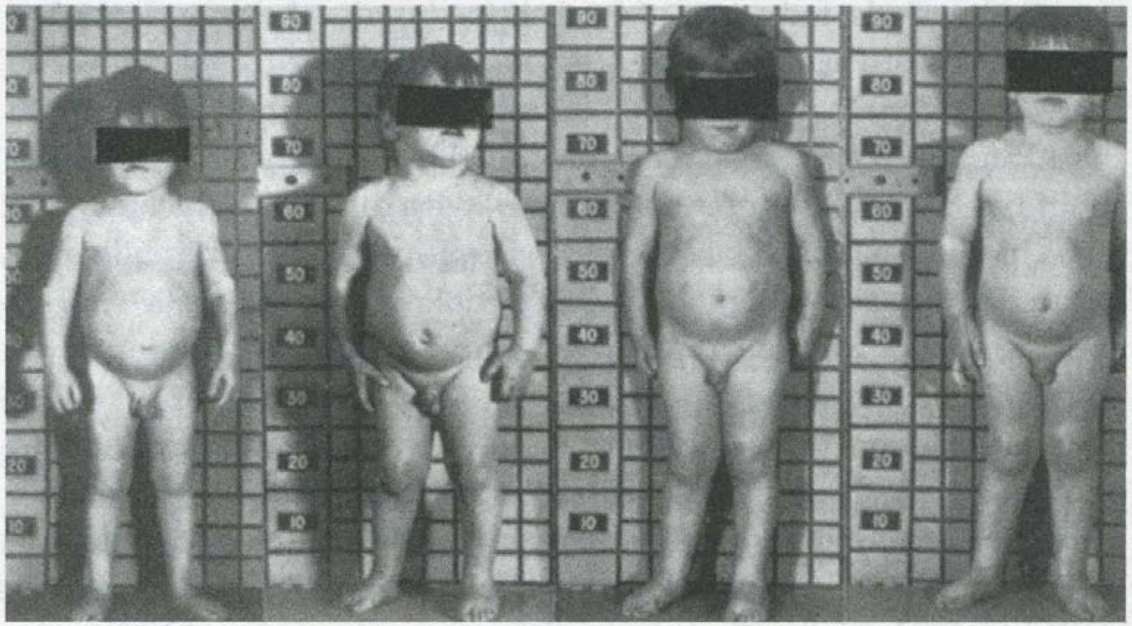
- Suppression of digestion

Stress-Related Disorder

- Ulceration, colitis
- Ulcer – hole in the wall of an organ
- Peptic (gastric, esophageal,duodenal)
 - Robert Warren/Barry Marshall/2005 Nobel
- – 1983
 - Bacterium – heliobacter pylori swallowed/gastritis
 - Antibiotic treatment
 - But 15% of cases unrelated
 - And only 10% with bacterium get ulcers

The Stress Response and its Consequences

Adaptive Stress-Response	Stress-related Disorder
• Suppression of growth	• Psychogenic dwarfism • British Victorian family • favorite son killed at 13 • Bereaved mother takes to bed – ignores 6 year-old son • "David is that you? Oh, it is only you." • David was perfect • 5ft as an adult • J.M. Barrie writes *Peter Pan*



A child suffering from stress dwarfism: changes in appearance during hospitalization (left to right).

A Demonstration of the Sensitivity of Growth to Emotional State

Condition	Growth hormone	Growth	Food intake
A. Entry into hospital	5.9	0.5	1663
B. 100 days later	13.0	1.7	1514
C. Favorite nurse on vacation	6.9	0.6	1504
D. Nurse returns	15.0	1.5	1521

Source: From Saenger and colleagues, 1977. Growth hormone is measured in nanograms of the hormone per milliliter of blood following insulin stimulation; growth is expressed as centimeters per 20 days. Food intake is expressed in calories consumed per day.

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mid 1950s
Meyer Friedman
Ray Rosenman
cardiology
practice

4/5 years later

TYPE A
PERSONALITY

STRESS

Type-A Personality

Friedman & Rosenman, 1960s

immensely competitive, over-achieving, time-pressured, impatient, hostile

increased risk of cardiovascular disease like smoking, or high cholesterol

STRESS

Type-A Personality

failures to replicate

applies to early age

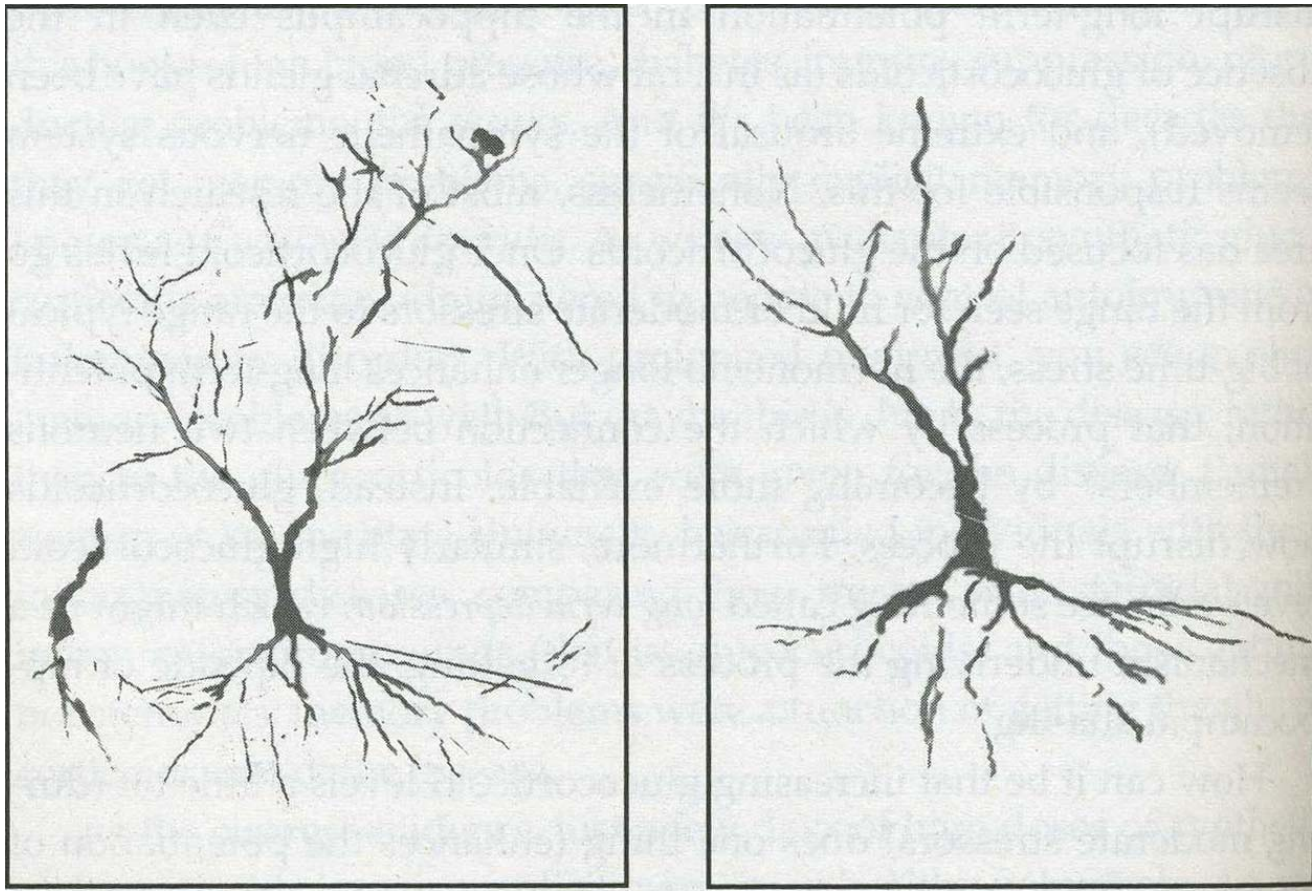
key - hostility - many replications

suppressed expression

The Stress Response and its Consequences

Adaptive Stress-Response	Stress-related Disorder
• Mobilization of energy	• Myopathy, fatigue, diabetes
• Increased cardiovascular tone	• Stress-induced hypertension
• Suppression of digestion	• Ulceration, colitis
• Suppression of growth	• Psychogenic dwarfism
• Suppression of reproduction	• Amenorrhea, impotency, loss of libido
• Suppression of immune system	• Increased disease risk
• Sharpening of cognition	• Neuron death

(Sapolsky, 1992)



Neurons of the hippocampus of a rat. On the left: healthy neurons; on the right: neurons with their projections atrophied by sustained stress.

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POST-TRAUMATIC STRESS DISORDER (PTSD)

- a severe anxiety disorder that can develop after exposure to any event which results in psychological trauma
- re-experience original trauma through flashbacks and dreams, increased arousal, hypervigilance
- assault/rape, combat
- sustained in about 20% of people

POST-TRAUMATIC STRESS DISORDER (PTSD)

- smaller hippocampal volumes in PTSD (some variability in results)

POST-TRAUMATIC STRESS DISORDER (PTSD)

- smaller hippocampal volumes in PTSD (some variability in results)

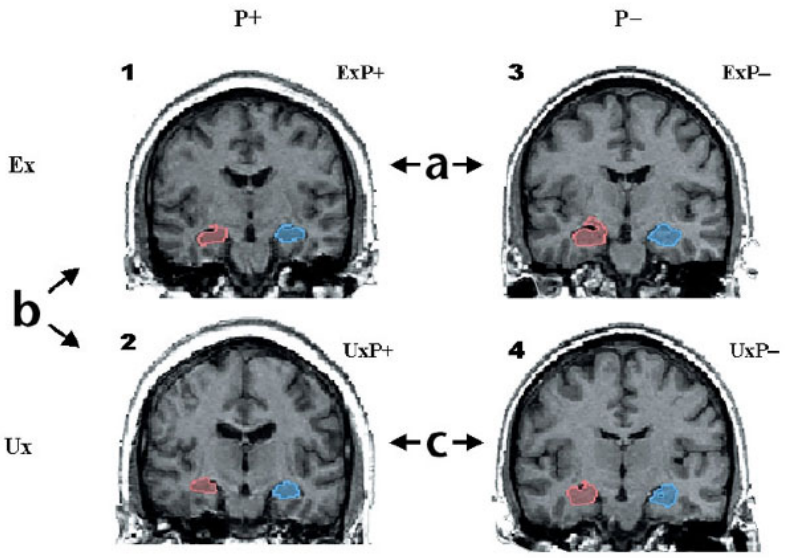
- cause or consequence?

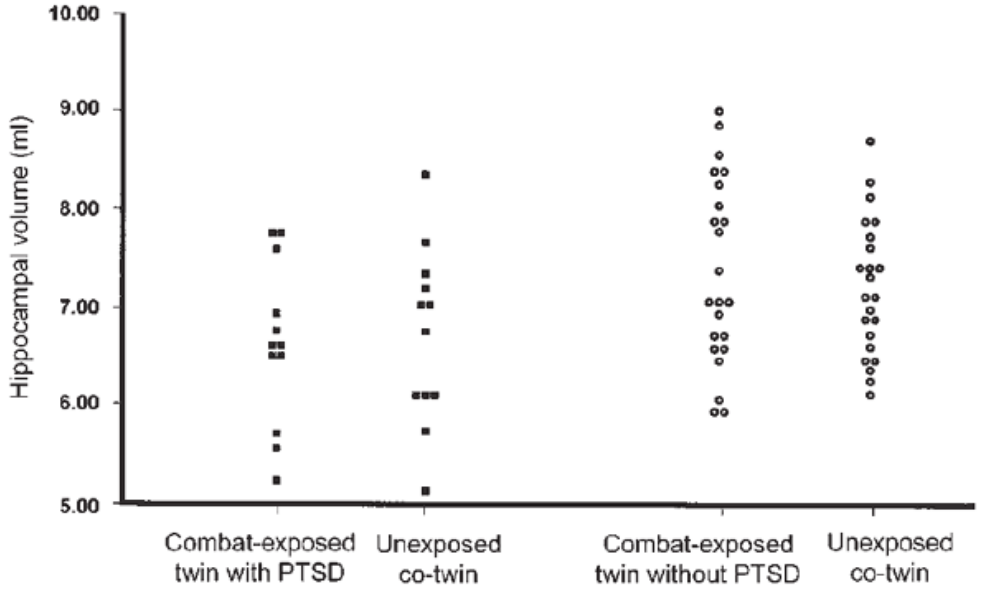
POST-TRAUMATIC STRESS DISORDER (PTSD)

- smaller hippocampal volumes in PTSD (some variability in results)

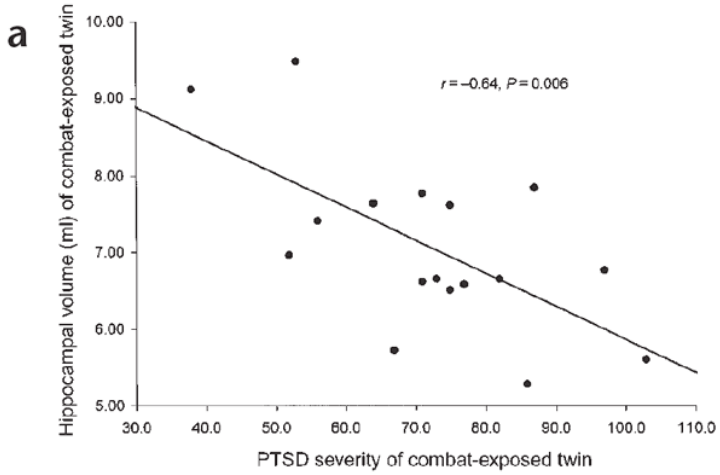
- cause or consequence?

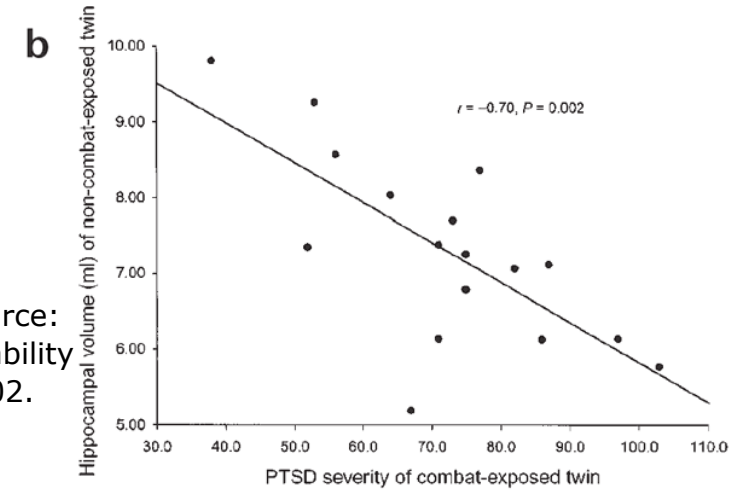
- twin study - correlation among monozygotic twins with and without combat exposure in hippocampal volume





Association between greater PTSD severity in combat-exposed twin and smaller hippocampal volume in both combat-exposed and non-combat exposed twin



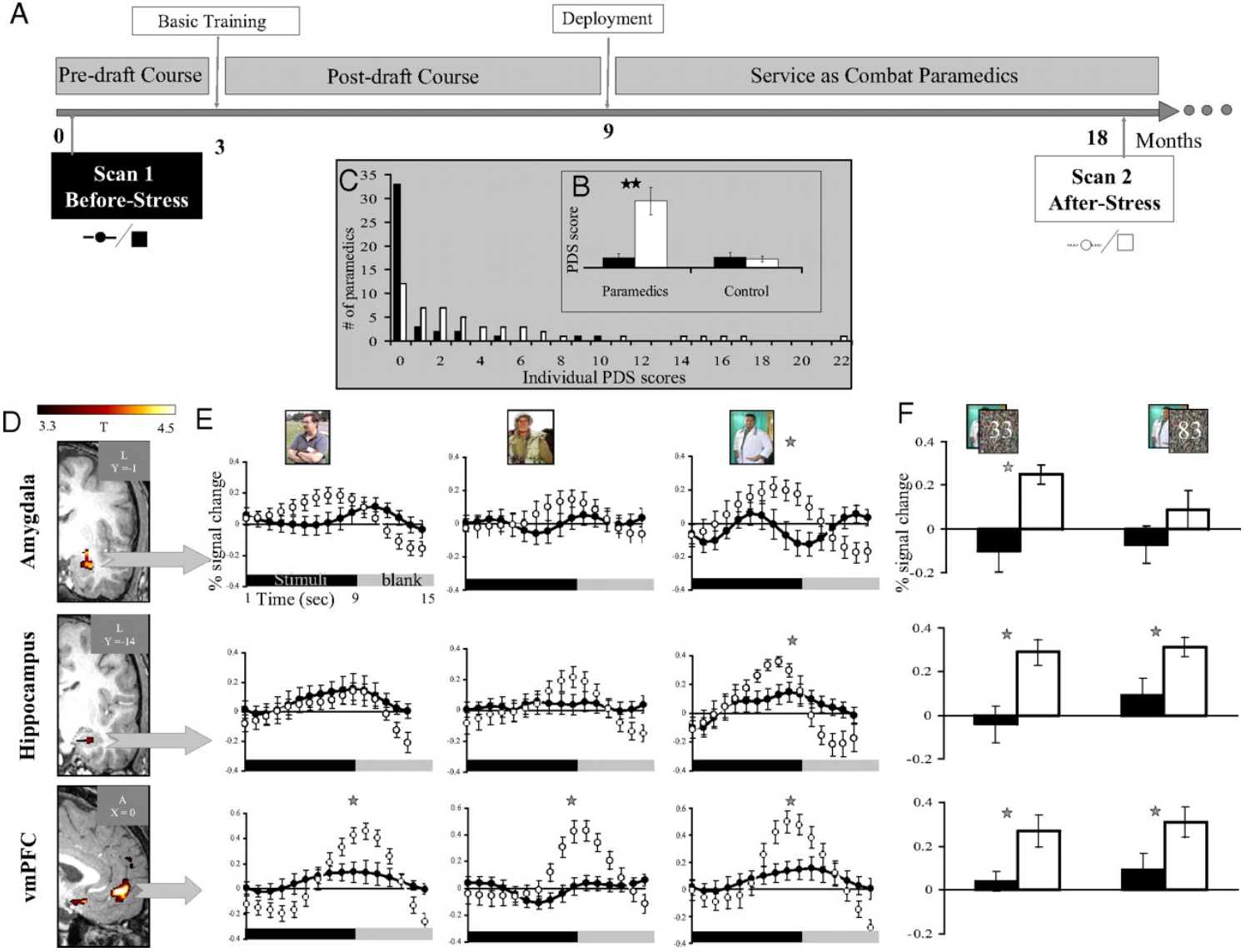


Reprinted by permission from Macmillan Publishers Ltd: Nature Neuroscience. Source: Gilbertson, M. W., et al. "Smaller Hippocampal Volume Predicts Pathologic Vulnerability to Psychological Trauma." *Nature Neuroscience* 5, no. 11 (2002): 1242-47. © 2002.

POST-TRAUMATIC STRESS DISORDER (PTSD)

- prospective study
- Israeli military, 50 recruits before and after military service and stressful events
- increase in stress associated with greater amygdala and hippocampus response to stress-relate content
- amygdala reactivity before stress predicted increase in stress symptoms
- hippocampus change over time correlated with stress symptoms; content-specific

(A) Timeline (months) of the prospective imaging study.



Admon R et al. PNAS 2009;106:14120-14125

Courtesy of Talma Hendler. Used with permission.

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Psychological Modifiers of the Stress Response

- Outlets for frustration
- Sense of predictability and of control
- A perception of life improving
- Social support

(Weiss, Levine, Sehgman)

Psychological Modifiers of the Stress Response

- *Outlets for frustration* (Jay Weiss)

 rats receive mild shocks

 prolonged stress response - heart rate up,

 glucocorticoid secretion up, ulcers

 other rats can gnaw on wooden bar, or eat, or drink, or run on wheel - fewer ulcers

 or run to another rate and bite it

 baboons attack bystanders after losing a fight

Psychological Modifiers of the Stress Response

- *Sense of predictability and of control*
- rats hear warning bell before shock - fewer ulcers - predictability (vs. unknown)
- food delivered to rat at intermittent intervals vs. random delivery of equal food - glucocorticoid levels go up
- rat given lever to avoid shocks - even if lever is disconnected to shocks, stress response is reduced
- people - noxious noises – one person has button to press to stop noise - less hypertensive whether button is pressed or not
- occupational stress - high demand & low control

Psychological Modifiers of the Stress Response

- *Sense of predictability and of control*

Rodin & Langer, 1977

- nursing home

group A – make decisions for yourself

where to receive visitors

when to watch movie

what houseplant to take care of

group B – no instructions to make decisions

got plant, but staff took care of plant

1.5 years later – group A more cheerful, active, and alert, healthier, half as many had died

Psychological Modifiers of the Stress Response

- *Sense of predictability and of control*

Cultural Influences

Individualist – US/Europe

Collectivist – East Asian (and rest of the world?)

Elementary school 7-9 year olds, Asian-American or Anglo-American – Ms. Smith – six markers (6 colors) – six piles of anagrams (family, animal, etc. RIBD)

Random assignment to 3 groups

- you choose, teacher chooses, mother chooses

- Anglo-Americans self = 4X Ms Smith, 2.5X mother

- Asian-Americans - 30% more for mother than self, 2X than Ms Smith

Psychological Modifiers of the Stress Response

- *Sense of predictability and of control*

life and death struggle

Richter, 1957
Water temperature and endurance
Rats in a jar – how long does rat swim before drowning?
15 minutes-60 hours before giving up, much variation

Picked up rats, let them wriggle free, in and out of water,
Average of 60 hours of effort

Psychological Modifiers of the Stress Response

- *Social support*
- Primates - after stress response, among strangers - worse; among friends - better (measured by glucocorticoids)
- People - stressor (public speaking, math task, argument with strangers) - less cardio-vascular response with a supportive friend present
- Observations - people with spouses/close friends live longer; when spouse dies, risk of dying increases; parents of children killed in war have higher risk of disease/mortality only if divorced/widowed; patients with severe coronary disease had 3x death rate over 5 years if lacking social support

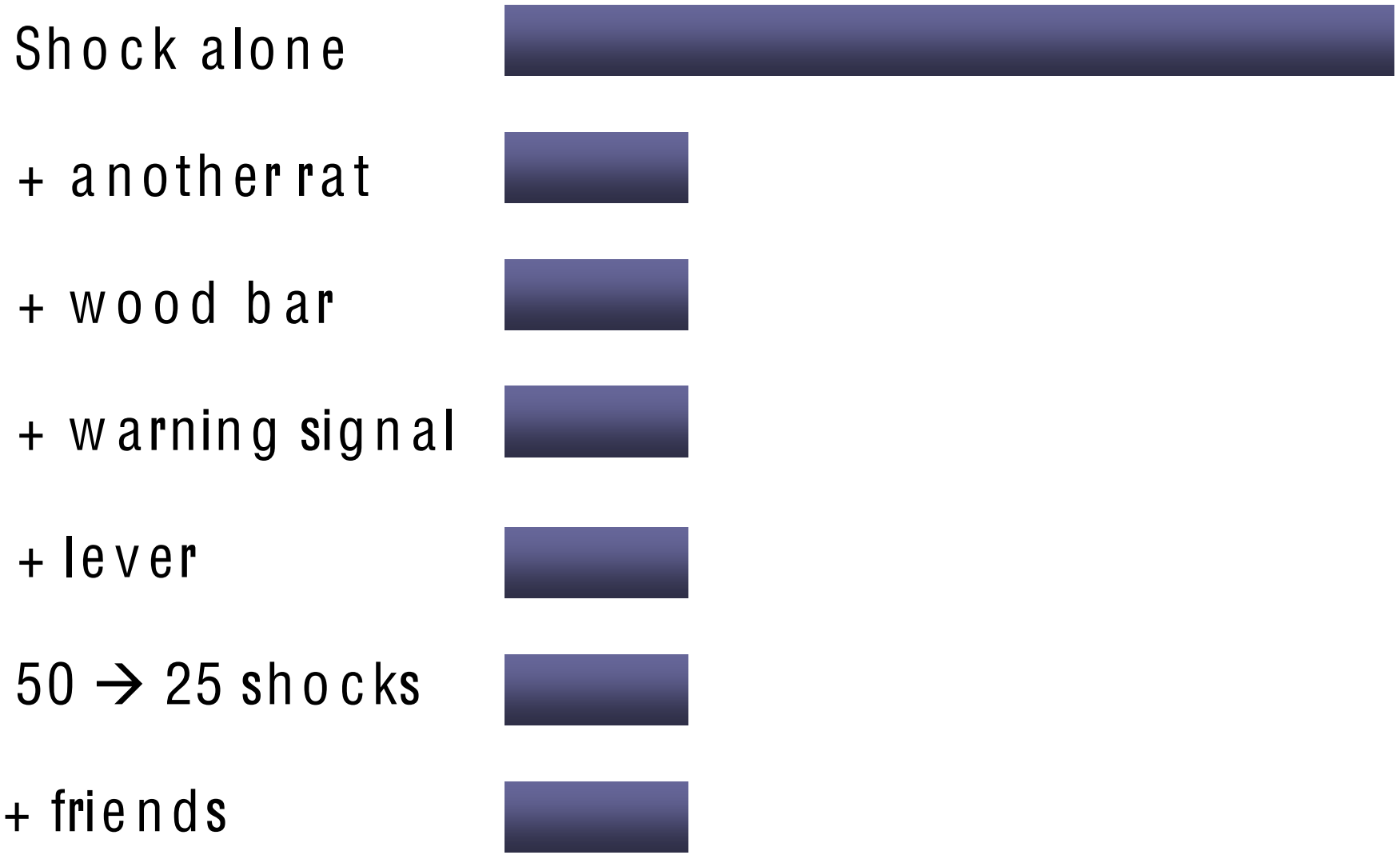
Psychological Modifiers of the Stress Response

- *A perception of life improving (worsening)*
- rats/shocks - rat #1 - 10/hr; rat #2 - 50/hr;

Day 2 - all rats get 25/hr; 10-25 becomes hypertensive

(Weiss, Levine, Sehgman)

Risk of Ulcer



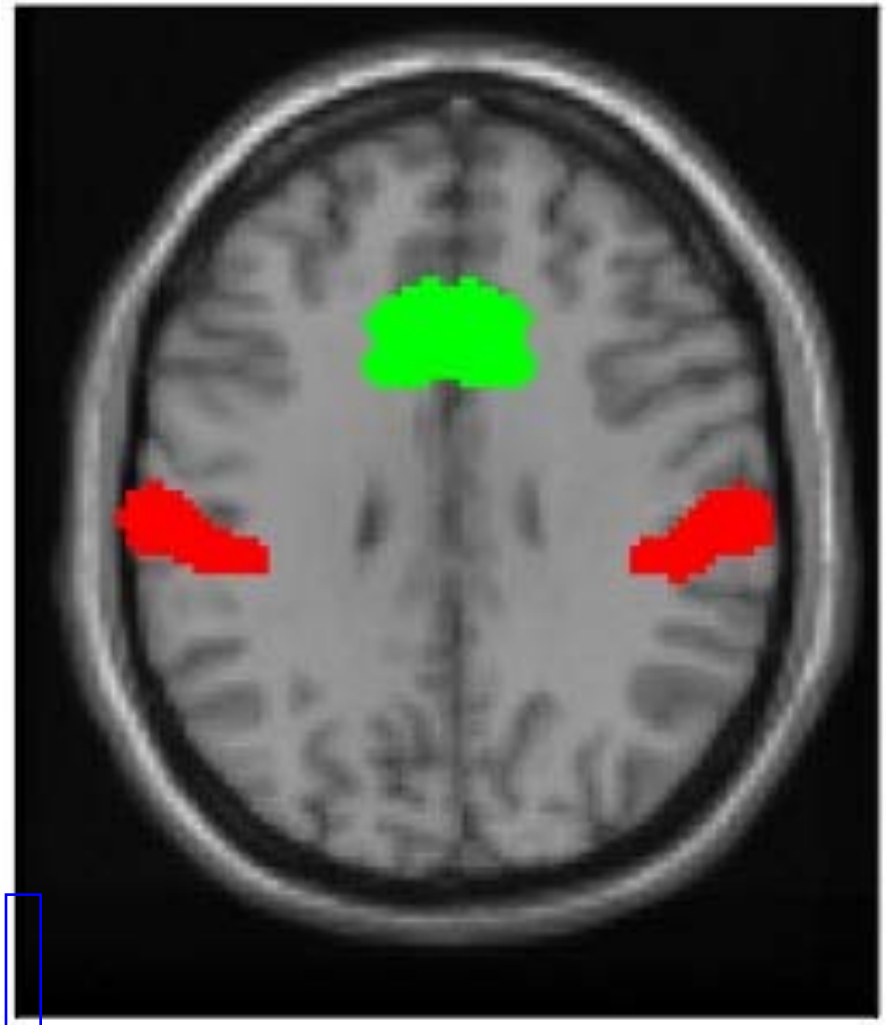
Embodied Cognition

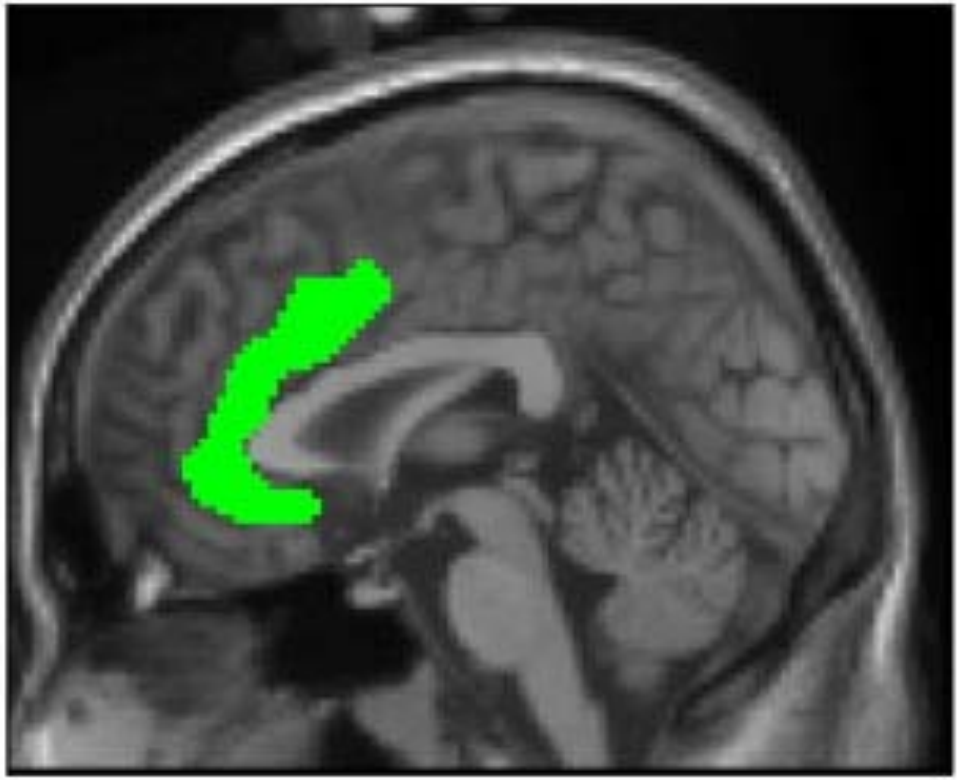
- **the nature of the human *mind* largely determined by the *form* of the human body**
- **ideas, thoughts, concepts, categories shaped by aspects of the body**
- **is *emotional pain* (social, romantic rejection) built out of *physical pain*?**

Pain

- sensory - objective
- affective - subjective (suffering, unpleasantness)

Pain Processing



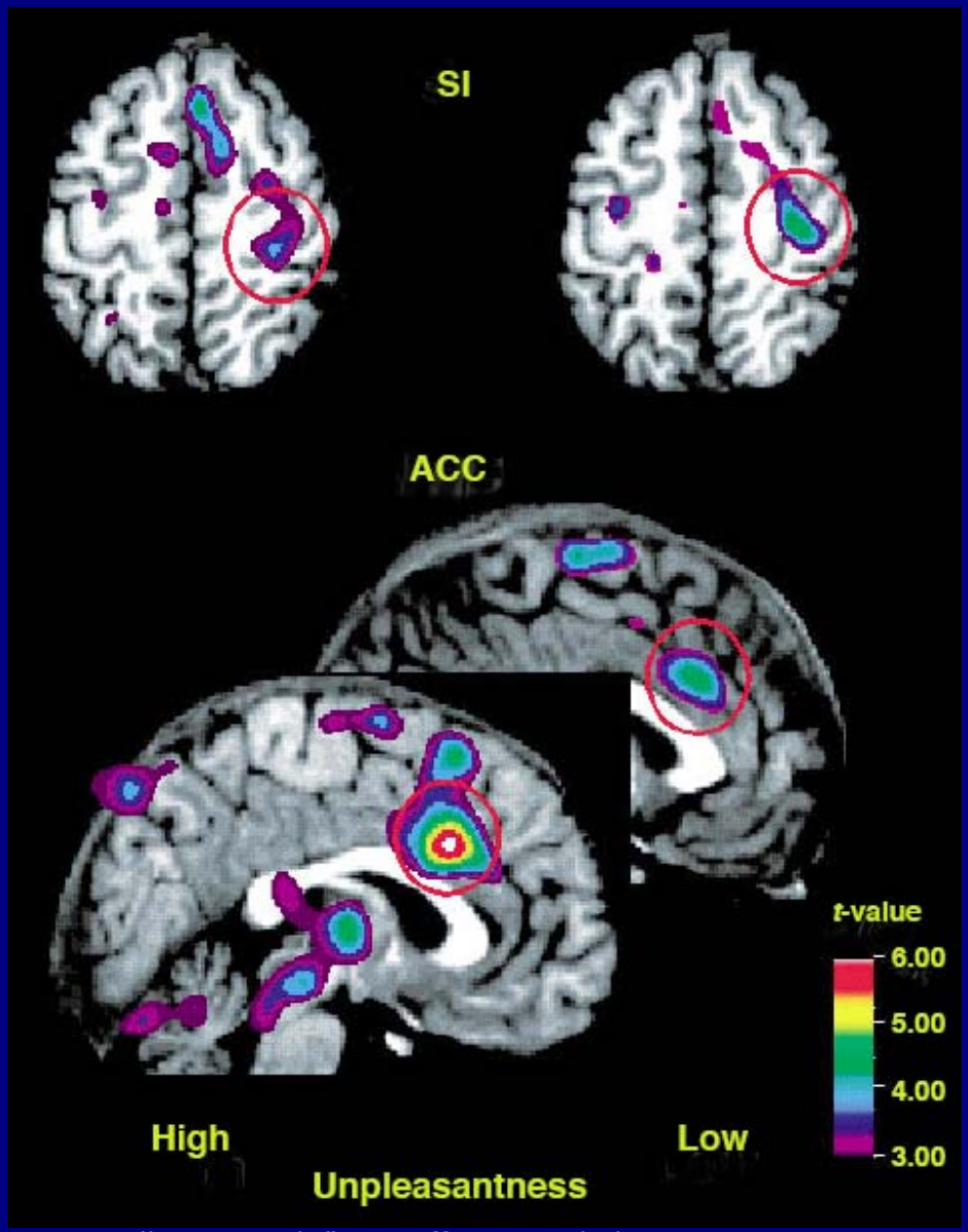


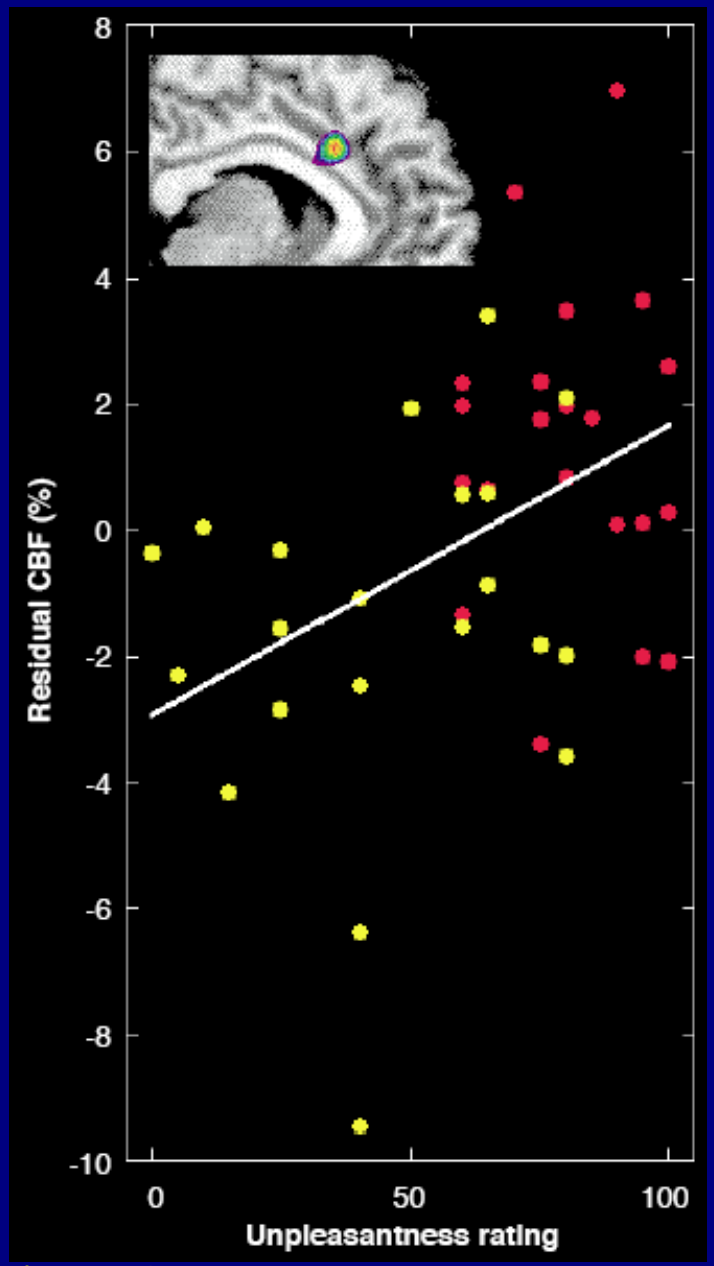
cingulate

somatosensory cortex

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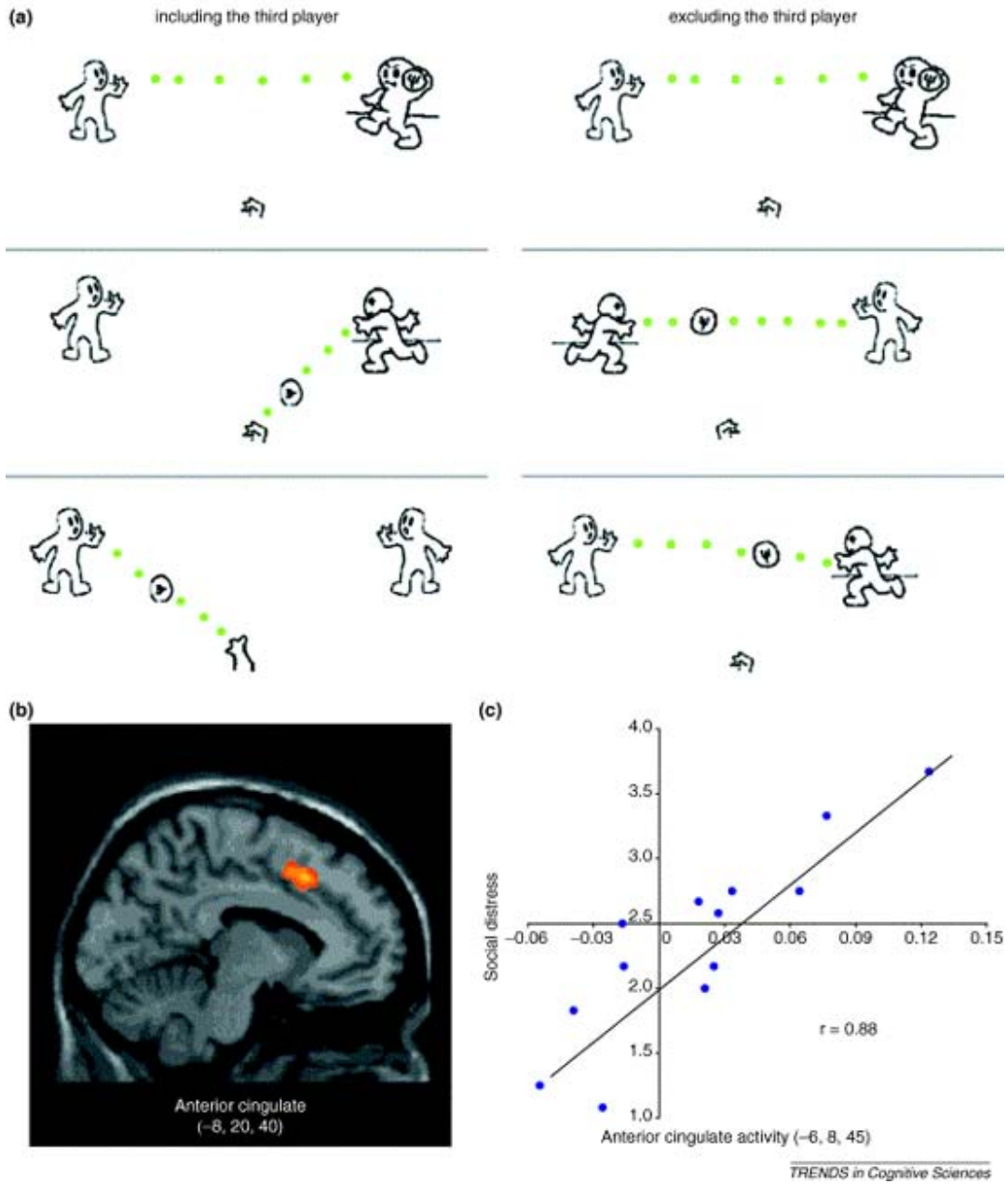
Hypnotic Suggestion of High or Low Pain





Source: Rainville, P., et al. "Pain Affect Encoded in Human Anterior Cingulate but not Somatosensory Cortex." *Science* 277, no. 5328 (1997): 968-71. © AAAS. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Social Pain



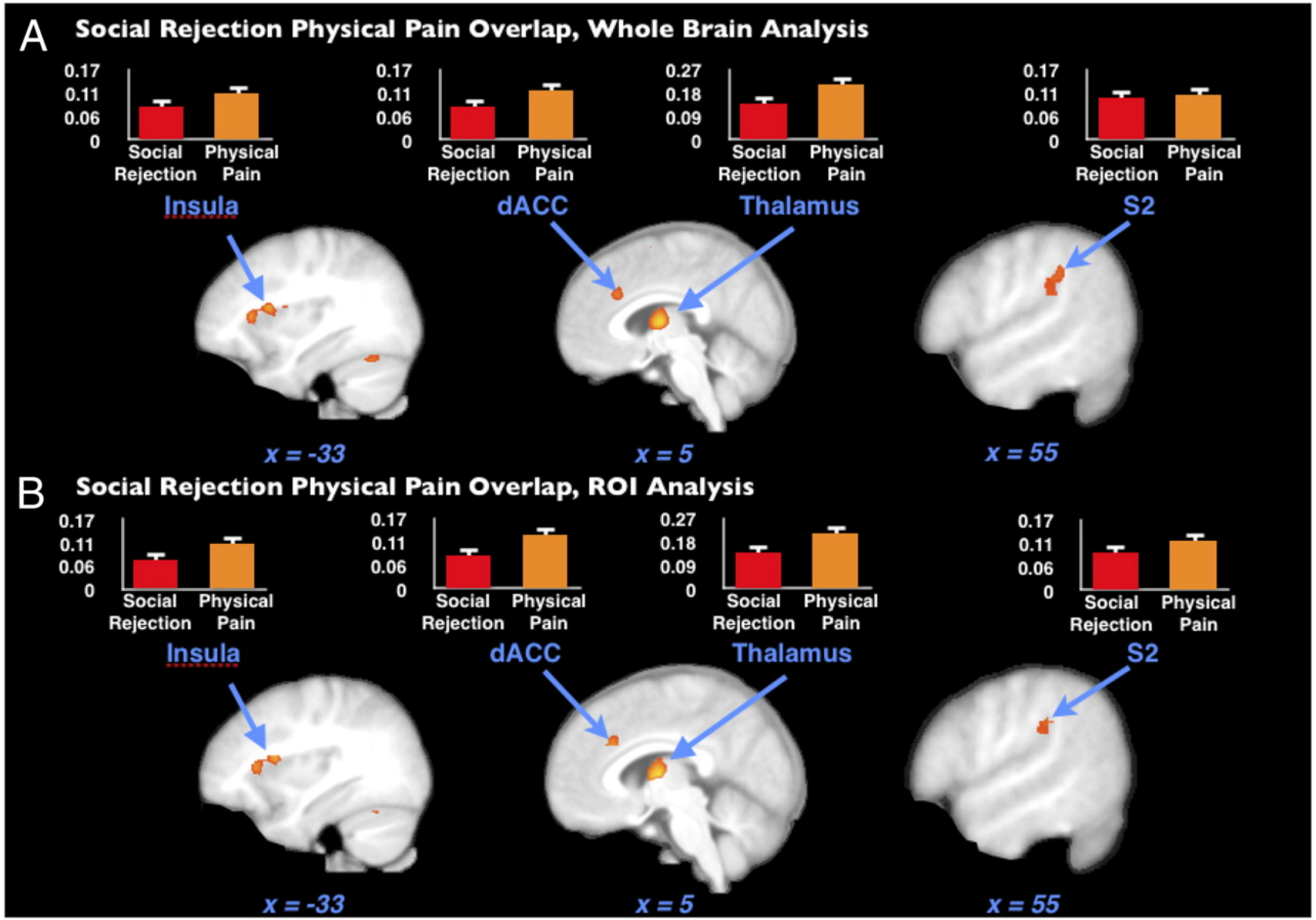
Methodology and results from an fMRI study of social exclusion. **(a)** Example of what participants viewed while in the scanner. Participants were included in the ball-tossing game during one round and excluded during another. **(b)** Participants showed increased dorsal anterior cingulate cortex (dACC) activity during the exclusion compared with the inclusion episode. **(c)** Participants' levels of self-reported distress correlated highly with dACC activity during the exclusion episode compared with the inclusion episode.

Source: Eisenberger, N. I., and M. D. Lieberman. "Why Rejection Hurts: A Common Neural Alarm System for Physical and Social Pain." *Trends in Cognitive Sciences* 8, no. 7 (2004): 294-300. Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

Romantic Pain

- Physical pain (heat)
- Romantic pain/social rejection
- Participants "felt intensely rejected as a result of recently experiencing an unwanted romantic relationship break-up"
- Viewed pictures of ex-partners and thought about being rejected (vs. viewing pictures of friends and thinking about positive experiences

Neural overlap between social rejection & physical pain



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Kross E et al. PNAS 2011;108:6270-6275

Pain of Social Rejection

- random assignment

 - 2000 mg acetaminophen (Tylenol, Excedrin) for 3 weeks

 - placebo

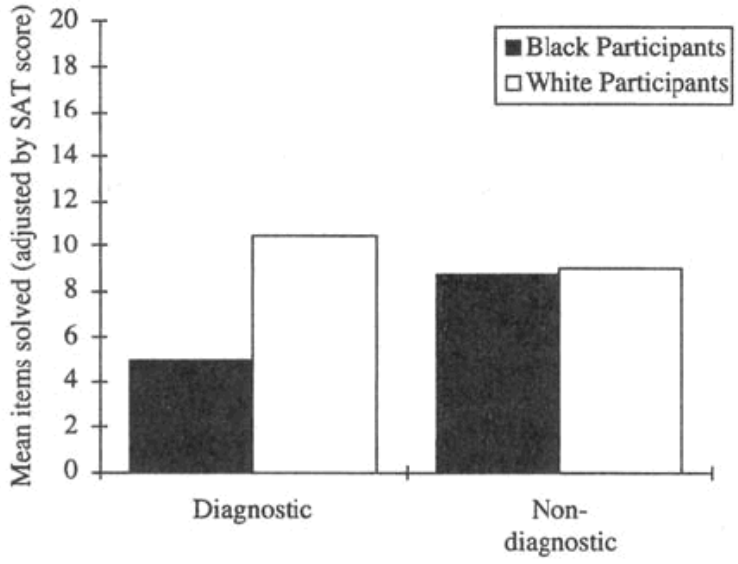
- provide daily reports
- by Day 15, less painful resposne to rejection
- less brain response to social rejection

Stereotype Threat

threat that others' judgments or one's own actions will confirm negative stereotypes about one's group

stress from stereotype knowledge undermines performance

Figure 2
Mean Performance on a Difficult Verbal Test as a Function of Race and Test Characterization



Note. SAT = Scholastic Assessment Test.

Source: Steele, Claude M. "A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance." *American Psychologist* 52, no. 6 (1997): 613-29.Courtesy of American Psychological Association. Used with permission.

DEMO

Unpleasant	Pleasant
abuse	caress
crash	freedom
filth	health
murder	love
sickness	peace
accident	cheer
death	friend
grief	heaven
poison	loyal
stink	pleasure
assault	diamond
disaster	gentle

Black Americans	White Americans
ALONZO	ADAM
JAMEL	CHIP
LERONE	HARRY
THEO	ALAN
JEROME	FRANK
LEROY	IAN
DARNELL	JUSTIN
LAMAR	FRED
RASHAUN	JED
DEION	TODD
LAMONT	HANK
MALIK	WILBUR

LEFT for Unpleasant		RIGHT for Pleasant
	cancer	
	health	
	corpse	
	diamond	
	truth	
	devil	
	assault	
	triumph	
	glory	
	brutal	
	talent	
	agony	
	kindness	
	family	
	divorce	
	stink	
	peace	
	torture	

LEFT for BLACK

ALONZO
JAMEL
ADAM
LERONE
HARRY
CHIP
MALIK
TODD
LEROY
DARNELL
JUSTIN
FRED
LAMAR
HANK
DEION
FRANK
JED
RASHAUN

RIGHT for WHITE

FRANK
devil
ANDREW
diamond
MALIK
health
TYRONE
triumph
BRAD
brutal
RASHAUN
agony
HARRY
family
JACK
beauty
LAMAR
stink

LEFT
for
Unpleasant
or
BLACK

RIGHT
for
Pleasant
or
WHITE

RASHAUN
DARNELL
JUSTIN
FRED
LAMAR
HANK
DEION
FRANK
JED
ALONZO
JAMEL
ADAM
LERONE
HARRY
CHIP
MALIK
TODD
LEROY

LEFT for WHITE

RIGHT for BLACK

cancer
LAMAR
corpse
MATTHEW
truth
JED
assault
DEION
glory
JONATHAN
talent
LAMONT
kindness
JAMEL
divorce
TERRYL
peace
JUSTIN

LEFT
for
Unpleasant
or
WHITE

RIGHT
for
Pleasant
or
BLACK

- faster for “unpleasant or black” than “unpleasant or white”?

IMPLICIT ASSOCIATION TEST IAT

- faster for white + pleasant than black + pleasant? 75% of whites; 50% of blacks

- automatic sterotypes?

 attitudes vs.associations?

- many domains - aging, techies vs. fuzzies/in-group vs. outgroup

- https://implicit.harvard.edu/implicit/

IMPACT OF INTERRACIAL CONTACT ON EXECUTIVE FUNCTION

- Richeson et al., 2003
- White individuals completed IAT
- Go to a different room, interact with either black or white experimenter, videotaped comments on college fraternity system and racial profiling after 9/11
- Go back and perform Stroop task
- Measure interference (incompatible (BLUE) minus control (BLUE) trials))

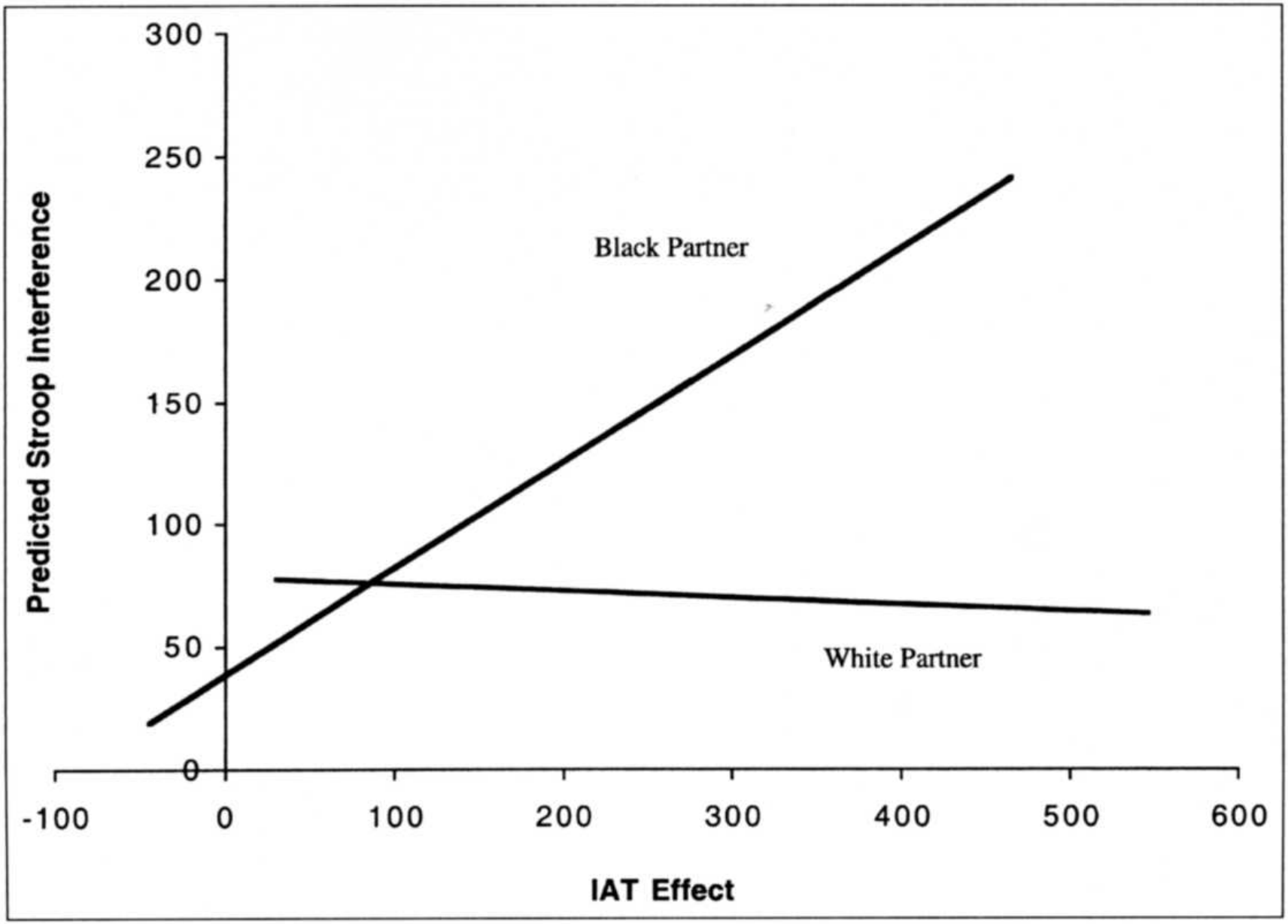


Fig. 1. Predicted Stroop interference as a function of Implicit Association Test (IAT) bias, after interaction with a White or Black partner.

Source: Richeson, J., and J. Shelton. "When Prejudice Does Not Pay: Effects of Interracial Contact on Executive Function." *Psychological Science* 14, no. 3 (2003): 287-90. © Sage publications. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

The Yerkes-Dodson Law

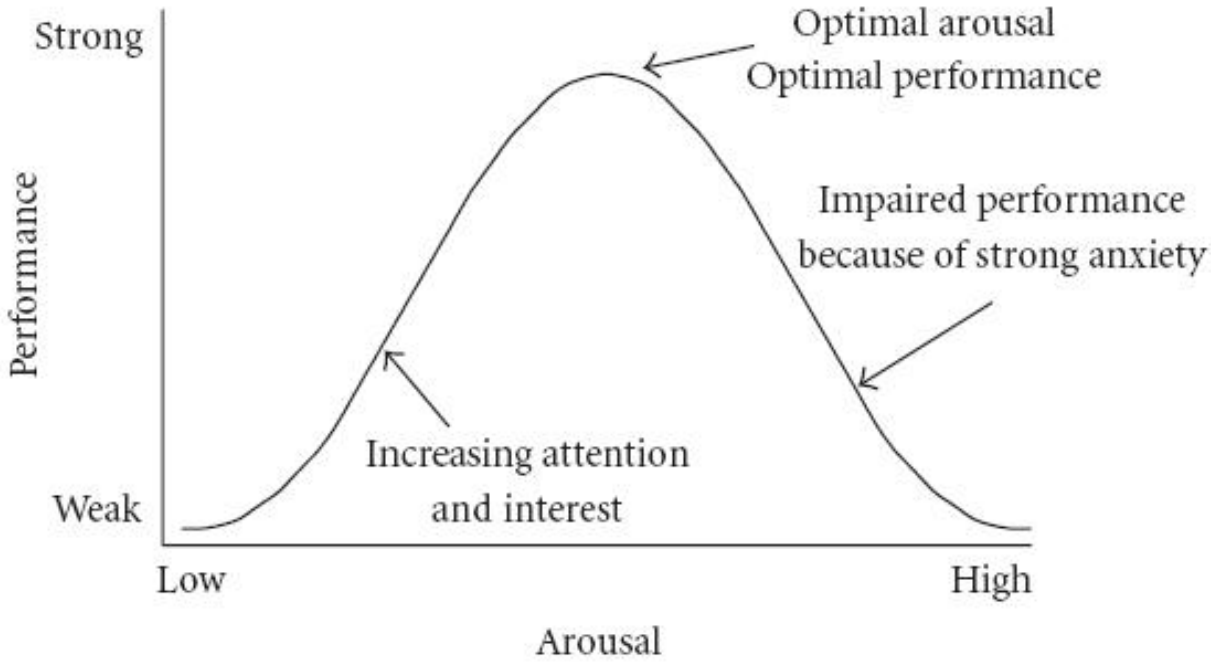


Image is Figure 3 from Diamond D. M., et al. "The Temporal Dynamics Model of Emotional Memory Processing: A Synthesis on the Neurobiological Basis of Stress-Induced Amnesia, Flashbulb and Traumatic Memories, and the Yerkes-Dodson Law." *Neural Plasticity* 33 (2007) dx.doi.org/10.1155/2007/60803.

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PSYCHOPATHOLOGY I

John Gabrieli

9.00

PSYCHOPATHOLOGY

- HISTORY
- DIAGNOSIS & LABELS
- SCHIZOPHRENIA (film)

PSYCHOPATHOLOGY

Schizophrenia

Bipolar Disorder

Depression

Substance Abuse (drugs, alcohol)

Anxiety

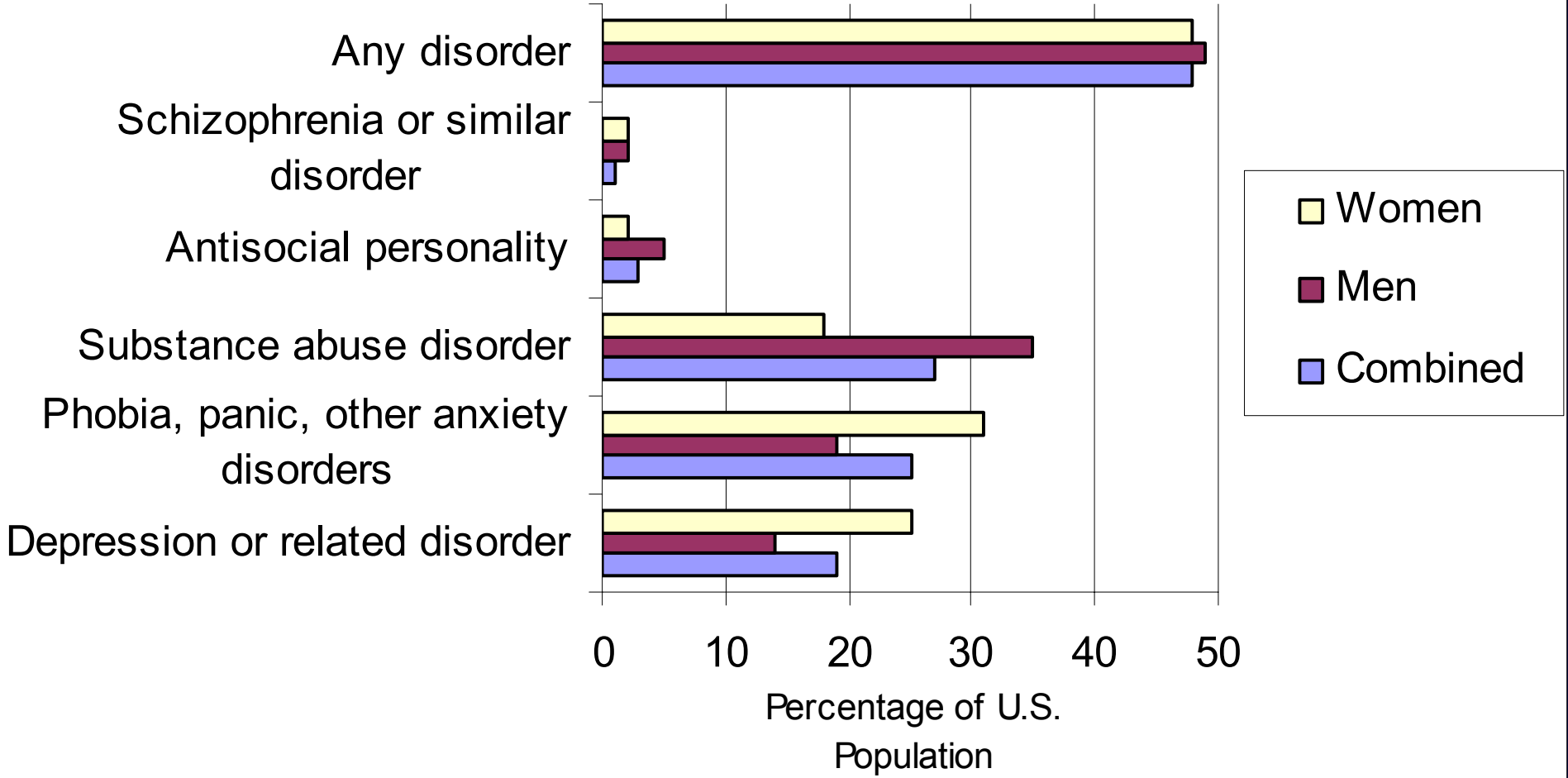
Panic Disorder

Phobia (Social Phobia)

Autism, ADHD, Dyslexia

Obsessive Compulsive Disorder

Lifetime prevalence of psychological disorders



Ages 19-25

- survey of 5,000 young adults in and out of college
- nearly 50% had a psychiatric disorder in past year
- similar whether in or out of college
- fewer than 25% with a disorder sought treatment

PSYCHOPATHOLOGY

Madness, Illness

Insanity as Demonic Possession

- **trephination as an escape**
 - **hole for demons**
- **witch hunts in 16th & 17th centuries**

Insanity as Disease

- **hospitals to segregate the mad chained, filthy,**
- **London "zoo" - penny/visit**
 - **96,000 in 1814**

Organic Illness

- **general parsesis & syphilis**

Psychological Illness

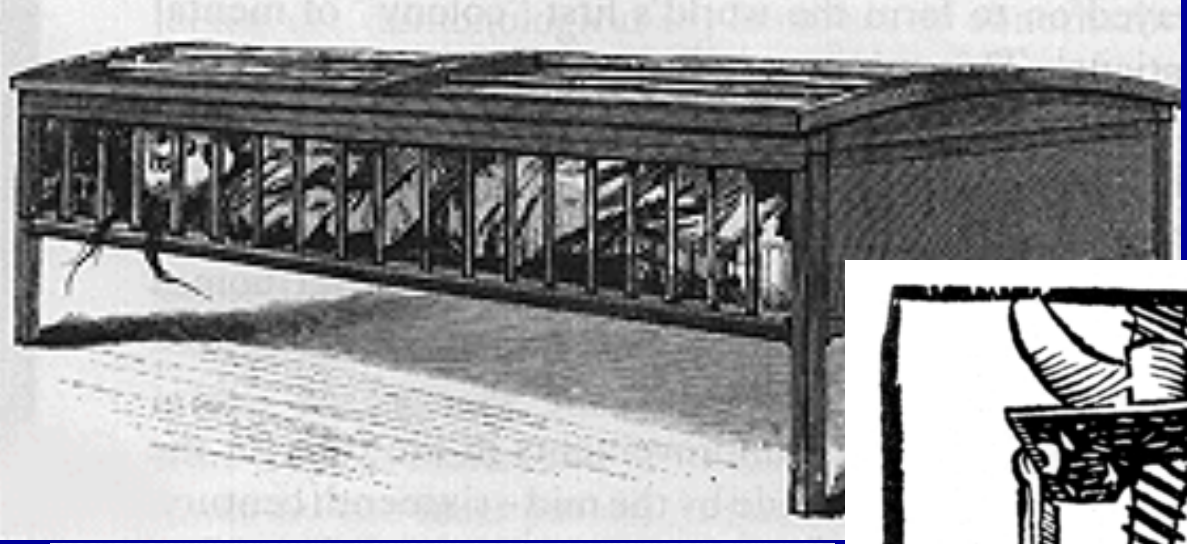
- **hysteria/conversion disorder/psychogenic**

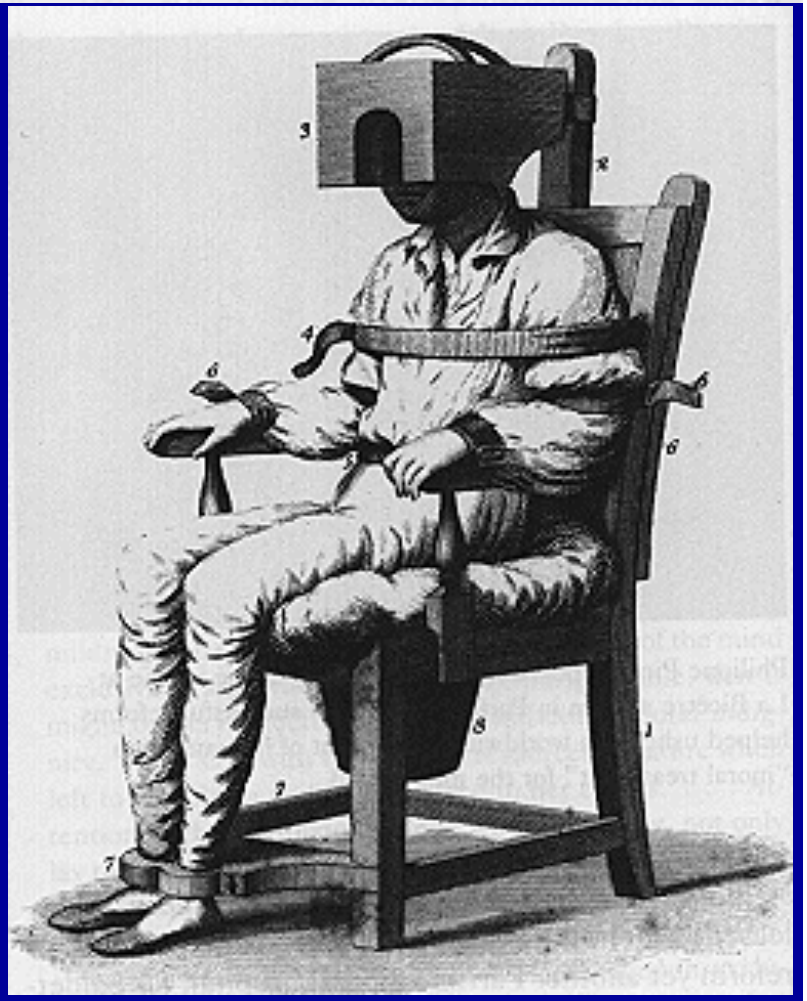


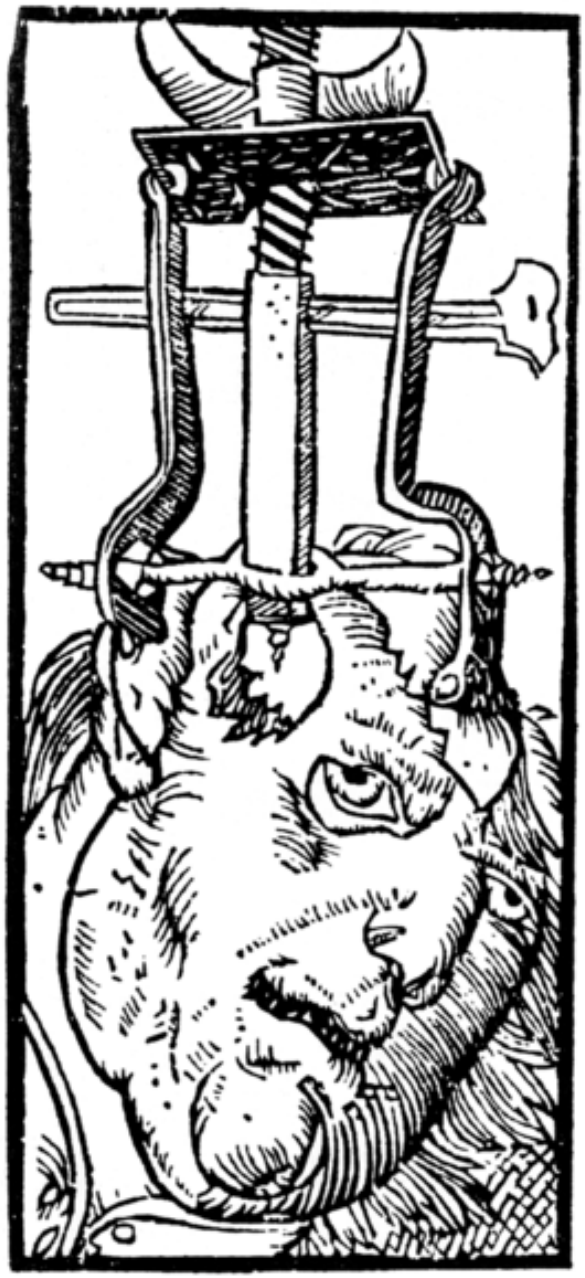


Trephining

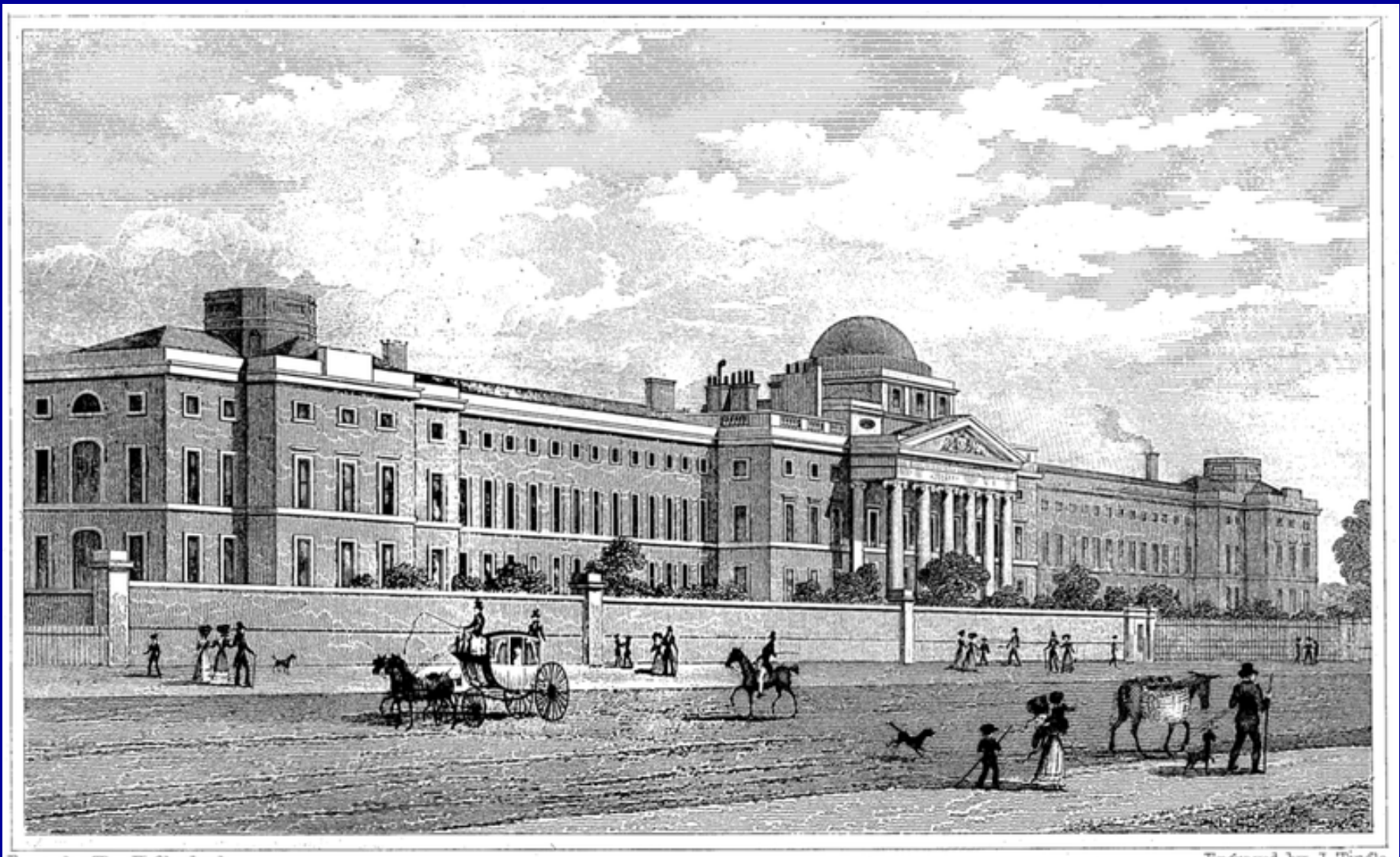
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Drawn by Tho. H. Shepherd.

Engraved by J. Tingle.

NEW BETHLEM HOSPITAL, ST. GEORGE'S FIELDS.





Egas Moniz (1875-1955)
Nobel Prize in Physiology or Medicine 1949



Image by Discover Magazine; license CC-BY.

1936: Freeman and Watts introduce frontal lobotomy in United States

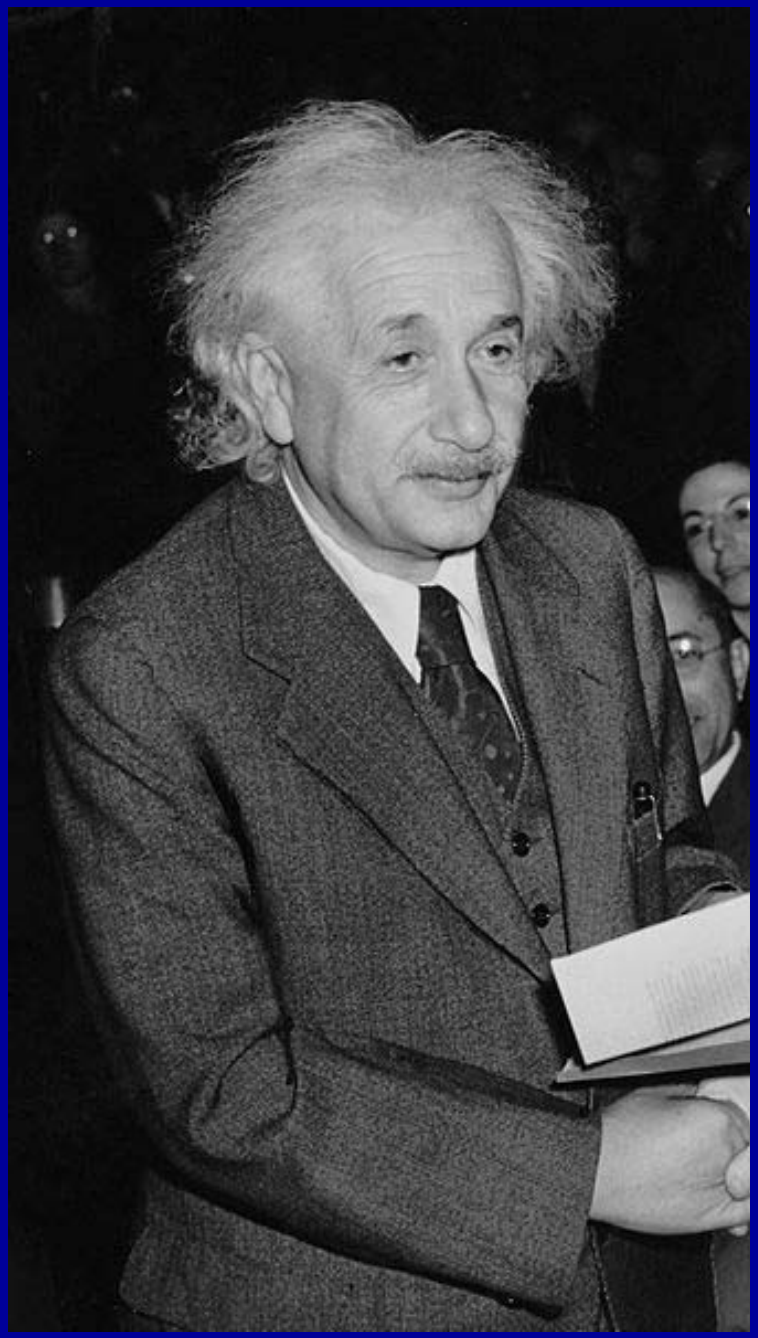
1942: "Icepick" lobotomy has spread worldwide (5000 people per year)

1949: Moniz wins Nobel prize

Reinterpretation – sedation & control vs. treatment

What is abnormal?

- Statistical deviance



What is a mental disorder?

A clinically significant behavioral or psychological syndrome or pattern that occurs in a person and that is associated with present distress (a painful symptom) or disability (impairment in one or more important areas of functioning) or with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom. (DSM-IV)

1840 - Dr. Ignaz Phillip Semmelweis

- rate of death from "childbed fever“ in a ward served by physicians was 4x as high as mothers in a ward in the same hospital served by midwives

- deaths tended to occur in women in the same rows of beds
- psychological? (priest/last rites/death bell) - no
- same doctor?
- didn't wash hands (unmanly)

- wash hands in a solution of chlorine and lime -
- deaths fell from 12% to 1.2% in 15 months

- 1848 revolution - fired - stopped - back to 15% death rate
- Joseph Lister 1880
- lost sanity, told people in streets to wash hands and avoid physicians, died in a mental institution in 1865

DIAGNOSIS

Myth of Mental Illness

a label for the unusual, nonconforming, deviant

rates of schizophrenia

Eskimos *nuthkavihak*	**4.4/1,000**
Yoruba *were*	**6.6/1,000**
Canada/Sweden	**5.6/1,000**

David Rosenhan

Professor of Law and Psychology, Emeritus
Stanford University

Rosenhan study - pseudopatients who heard voices - admitted - then ok - 7/8 diagnosed as schizophrenics - 19-72 days to get out - taking notes = "writing behavior" - "Schizophrenia, now in remission"

Rosenhan (1973): On Being Sane in Insane Places

One pseudopatient described that he had had a close relationship with his mother but was rather remote from his father during his early childhood. During adolescence and beyond, however, his father became a close friend, while his relationship with his mother cooled.

His present relationship with his wife was characteristically close and warm. Apart from occasional angry exchanges, friction was minimal. The children had rarely been spanked.

Rosenhan (1973): On Being Sane in Insane Places

"This white 39-year-old male . . . manifests a long history of considerable ambivalence in close relationships, which began in early childhood.

A warm relationship with his mother cools during his adolescence. A distant relationship to his father is described as becoming very intense. Affective stability is absent. His attempts to control emotionality with his wife and children are punctuated by angry outbursts and, in the case of the children, spankings.

And while he says that he has several good friends, one senses considerable ambivalence embedded in those relationships also."

Rosenhan (1973): On Being Sane in Insane Places

- After 7 to 52 days, released with Schizophrenia “in remission”
- “Patient resumes writing behavior”
- “Oral fixation” of mental patients
- Other patients were skeptical: "You're not crazy. You're a journalist, or a professor [referring to the continual note-taking]. You're checking up on the hospital."

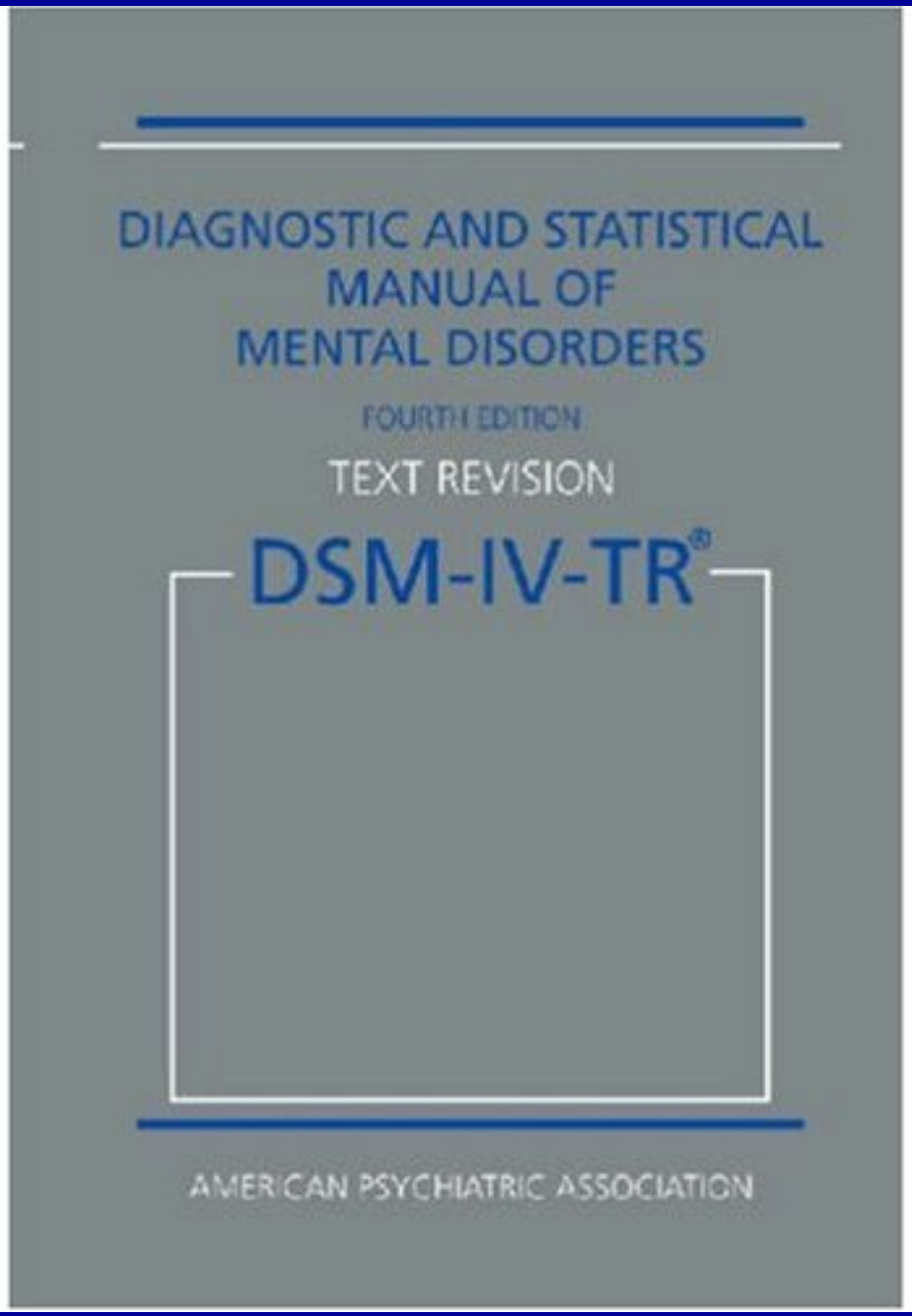
DIAGNOSIS

Criteria for diagnostic category

- **signs (what examiner sees) and symptoms (what patient says)**
- **syndrome = cluster of signs & symptoms**

- **can be reliably assessed**
- **validated by independent measures**
 - **natural history = clinical course & outcome**
 - **response to specific treatment**
 - **causality - etiology & pathogenesis**

- **Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-IV) - descriptions of signs & symptoms of psychiatric disease**



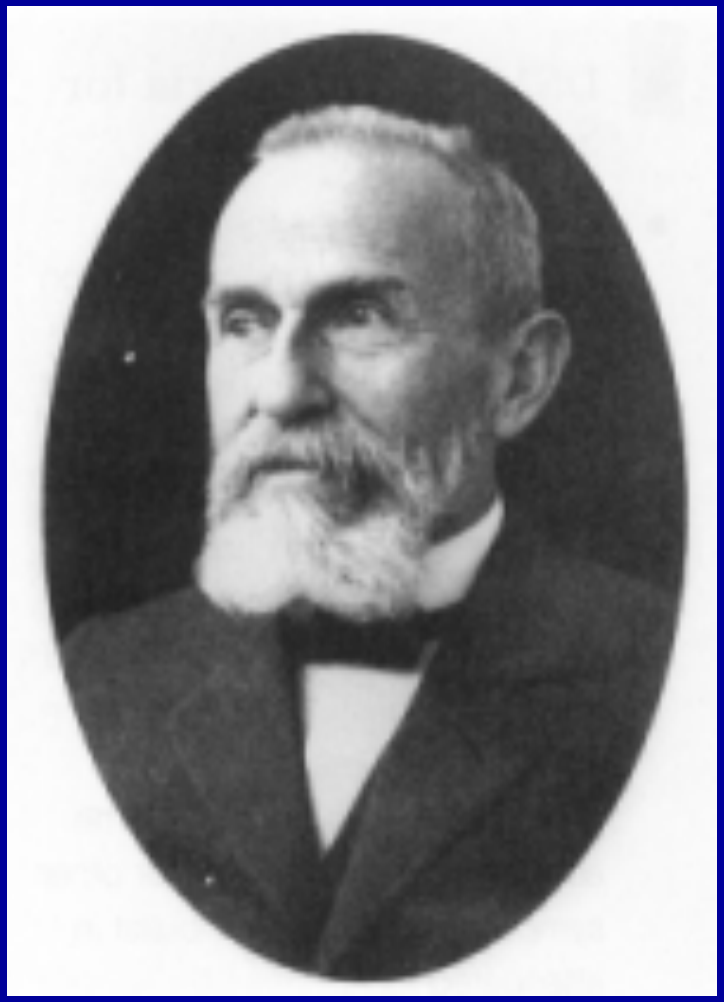
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Three benefits of labeling

- Allocation of resources
- Coordination of services (treatment) and research
- Predicting behavior of individuals



Eugen Bleuler

April 30, 1857 - July 15, 1939

SCHIZOPHRENIA

Bleuler 1911 - splitting of mental functions - disintegration of emotions, thought, and actions

Prevalence

- **1% of worldwide population - another 2-3% have schizotypal personality disorder**
- **no great geographical variation**
- **slight tendency for birth in winter or spring (virus?)**

Syndrome

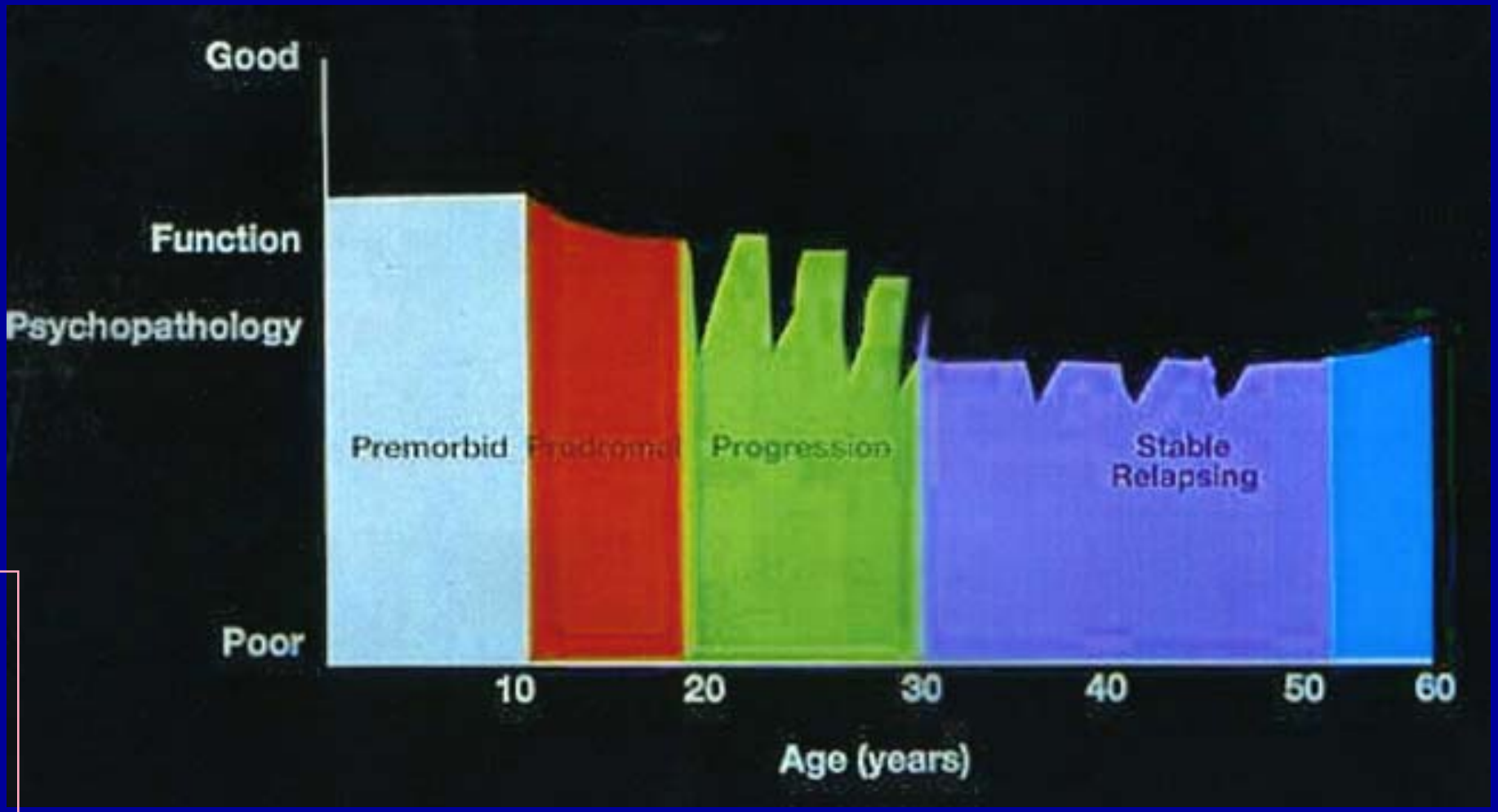
- ***Psychosis* – alteration in thoughts, perceptions, consciousness**
- **Thought disorder - disconnected, loose thoughts**
- **Abnormal beliefs or delusions**
 - **persecution, reference, control,**
 - **possession of thought**
- **Abnormal experiences/perceptions**
 - **auditory hallucinations**
- **Mood disorders - depression, anxiety**
- **Motor alterations - restlessness, purposeless overactivity**
- **Social function - withdrawal**
- **Negative - poverty of speech, poor attention span, flat affect, lack of motivation**
- **Positive - delusions, hallucinations, bizarre or disorganized behaviors**
- **Catatonia - mutism, abnormal posture**
- **Paranoia - persecution**

SCHIZOPHRENIA

Clinical History

- **Onset - late adolescence, early adulthood**
 - positive symptoms often most evident in acute schizophrenic episode
 - negative symptoms may predominate in chronic illness
 - quite variable
- **Outcome**
 - acute symptoms often respond positively to antipsychotic drugs
 - 25% may make full recovery
 - 25% remain severely disturbed
 - half may require long-term hospitalization
 - 50% more or less severe disorder fluctuating over many years

Natural History of Schizophrenia



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A Beautiful Mind

John F. Nash Jr.

1994 Nobel Prize in Economics

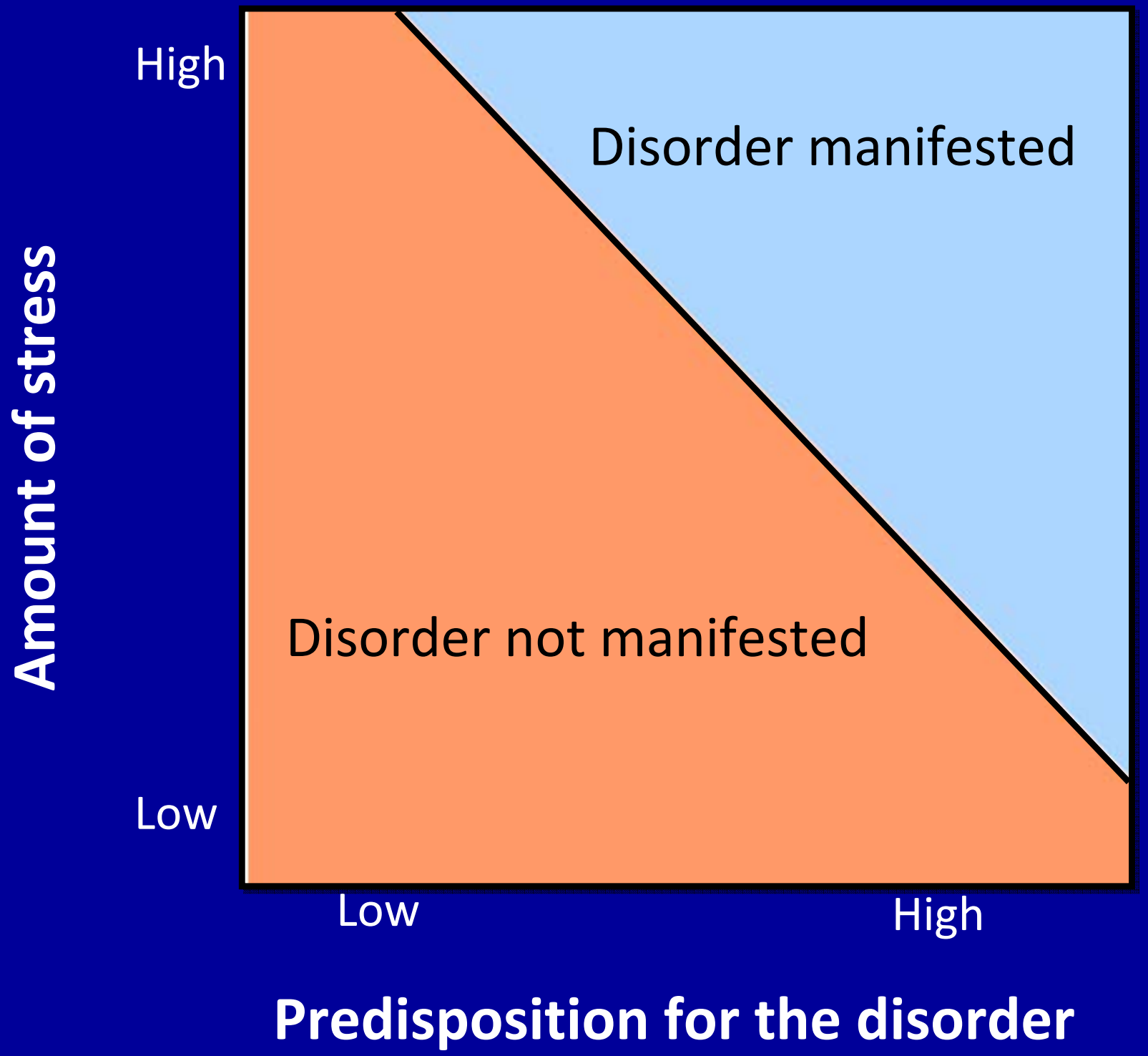
"John F. Nash introduced the distinction between cooperative games, in which binding agreements can be made, and non-cooperative games, where binding agreements are not feasible. Nash developed an equilibrium concept for non-cooperative games that later came to be called Nash equilibrium."

Born June 13, 1928
Aptitude with math in school
Went to CMU for college
Princeton for Ph.D.
"The Bargaining Problem"
"Non-Cooperative Games"
to MIT in 1951 instructor

SCHIZOPHRENIA

Hereditary Influences - Monozygotic twin concordance = 50%; dizygotic = 15% (same as siblings)

- **lifetime probability is 10% in first-degree relatives vs. 1% in general population**
 - **one parent = 13%**
 - **two parents = 50%**
- **concordance rate for monozygotic twins similar whether reared together or not**
- **being adopted away from relatives with schizophrenia does not reduce risk**
- **higher in urban areas; higher for moving across cultures (stress?)**
- **multifactorial polygenic-environmental threshold model**

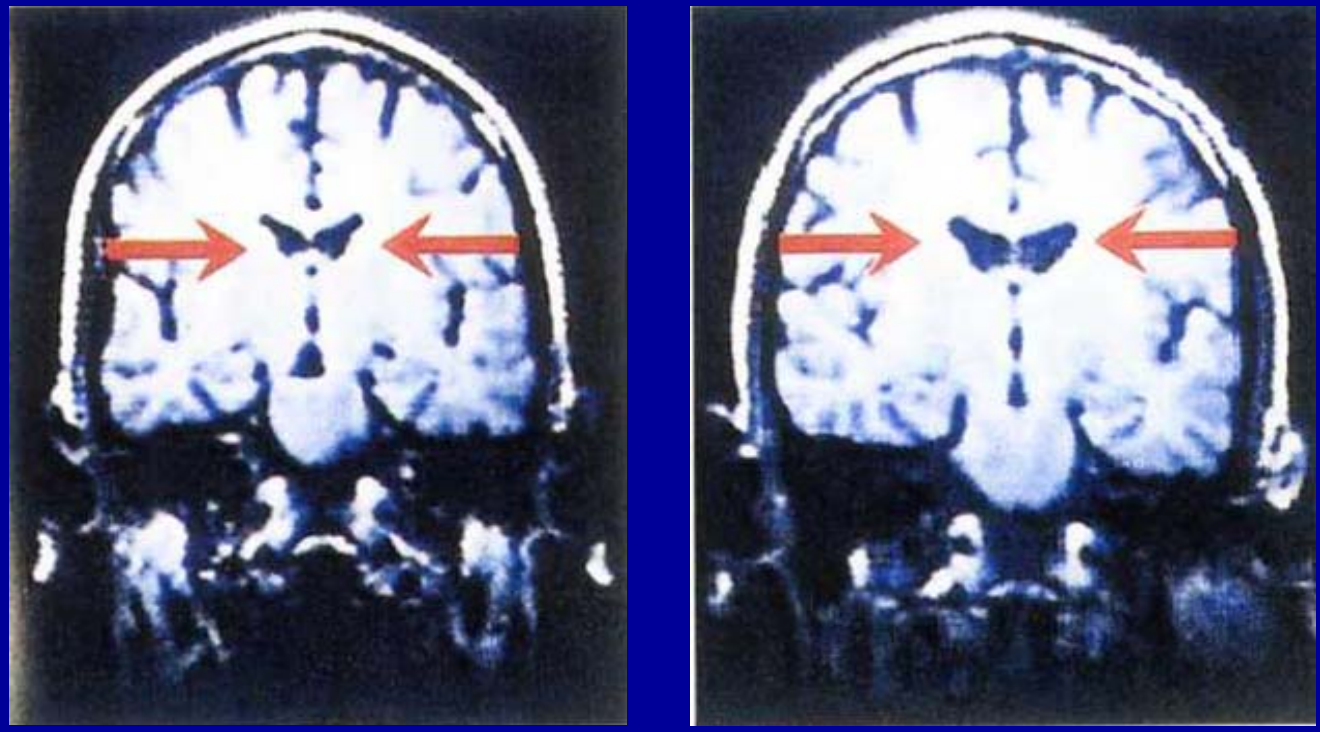

High
Disorder manifested
Amount of stress
Disorder not manifested
Low
Low
High
Predisposition for the disorder

SCHIZOPHRENIA

No definitive biological marker - heterogeneous symptoms

<u>Neuropathology</u>

- enlarged lateral ventricles, 3d ventricles, widened sulci
- hippocampal involvement?
- hypofrontality sometimes seen in PET scans
- failure to increase frontal activation during Wisconsin card sorting task
- atypicality seen in behavior and brain of non-psychotic first-degree relatives



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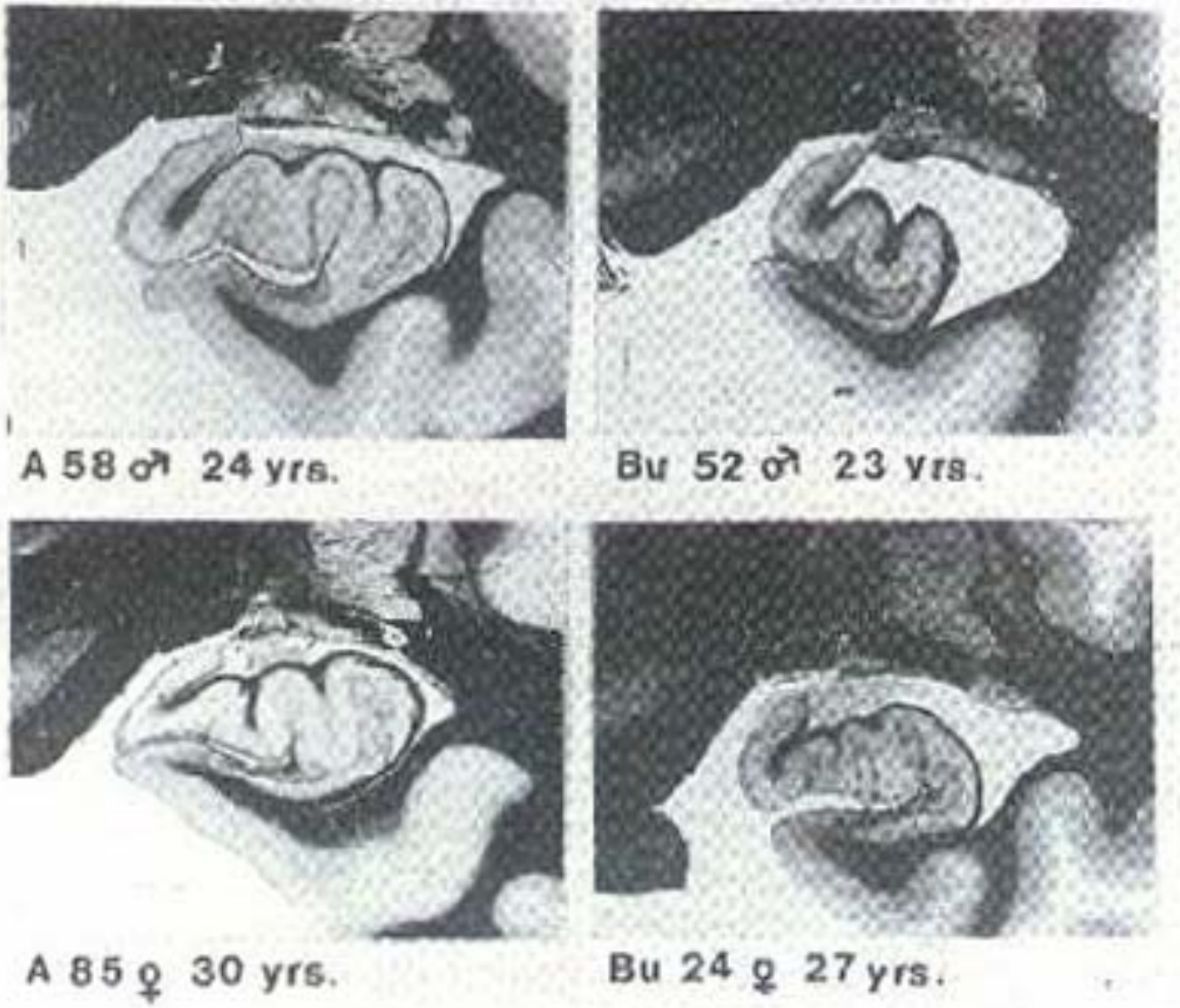


Figure 15.16 The hippocampus of normal people (left) and people with schizophrenia (right)
Notice the atrophy of the brains on the right. *(Source: Bogerts, Meertz, & Schonfeldt-Bausch, 1985; photos courtesy of B. Bogerts)*

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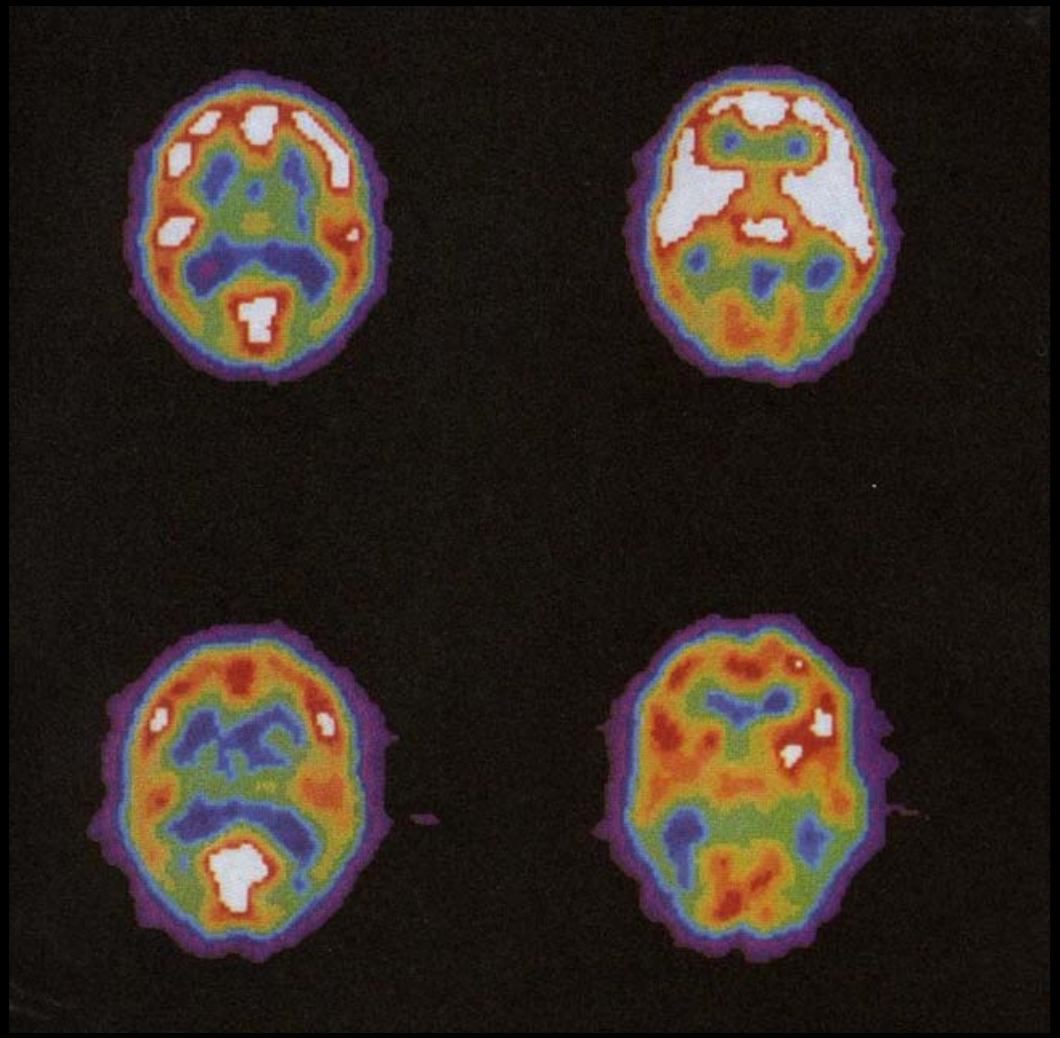


Figure 16.10
Cells of the hippocampus in a normal person (top) and a person with schizophrenia (bottom)
The cells on the bottom are arranged in a more haphazard. disorganized manner. (Photos courtesy of Arnold Scheibel.)

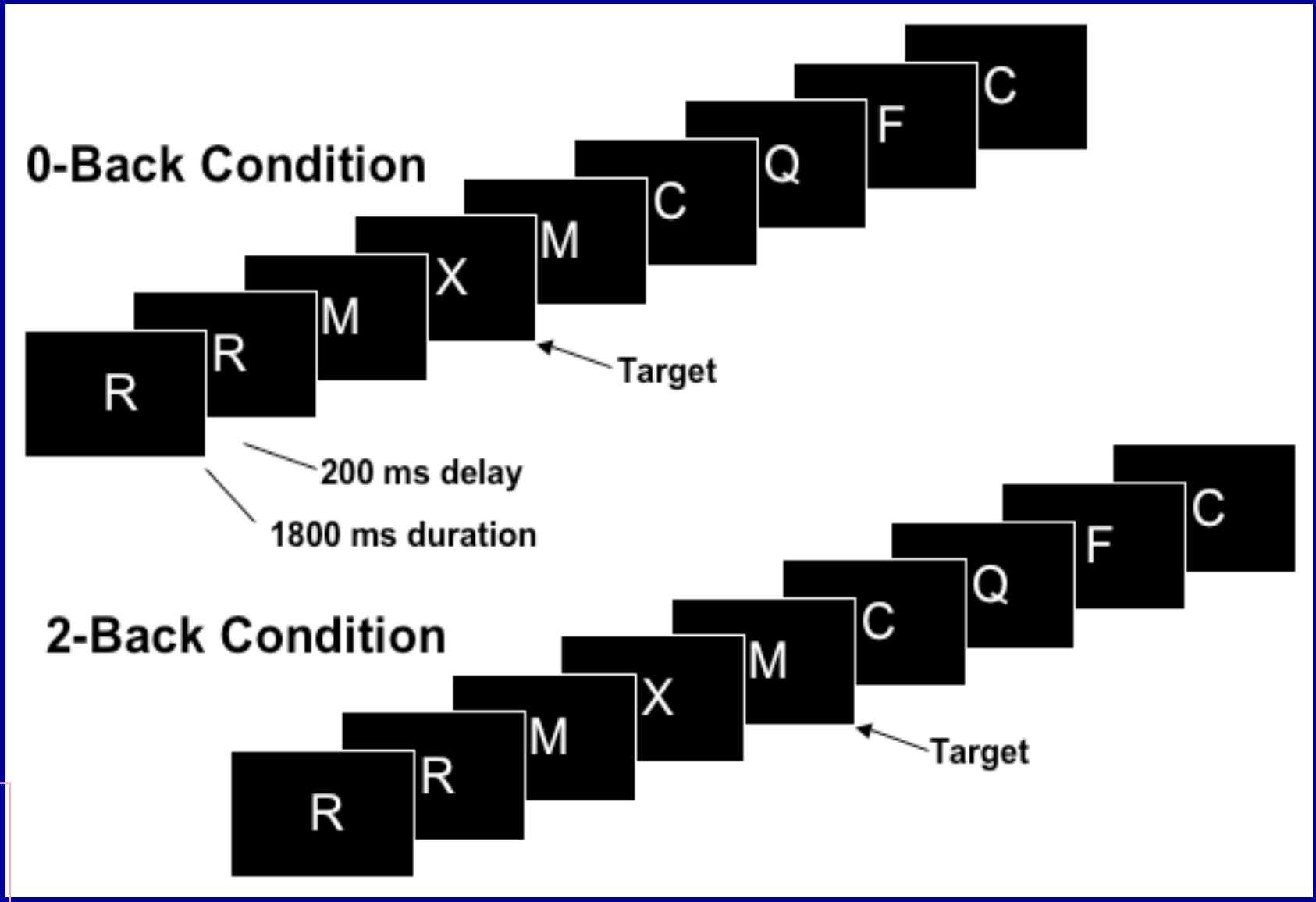
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Controls

Patients with schizophrenia



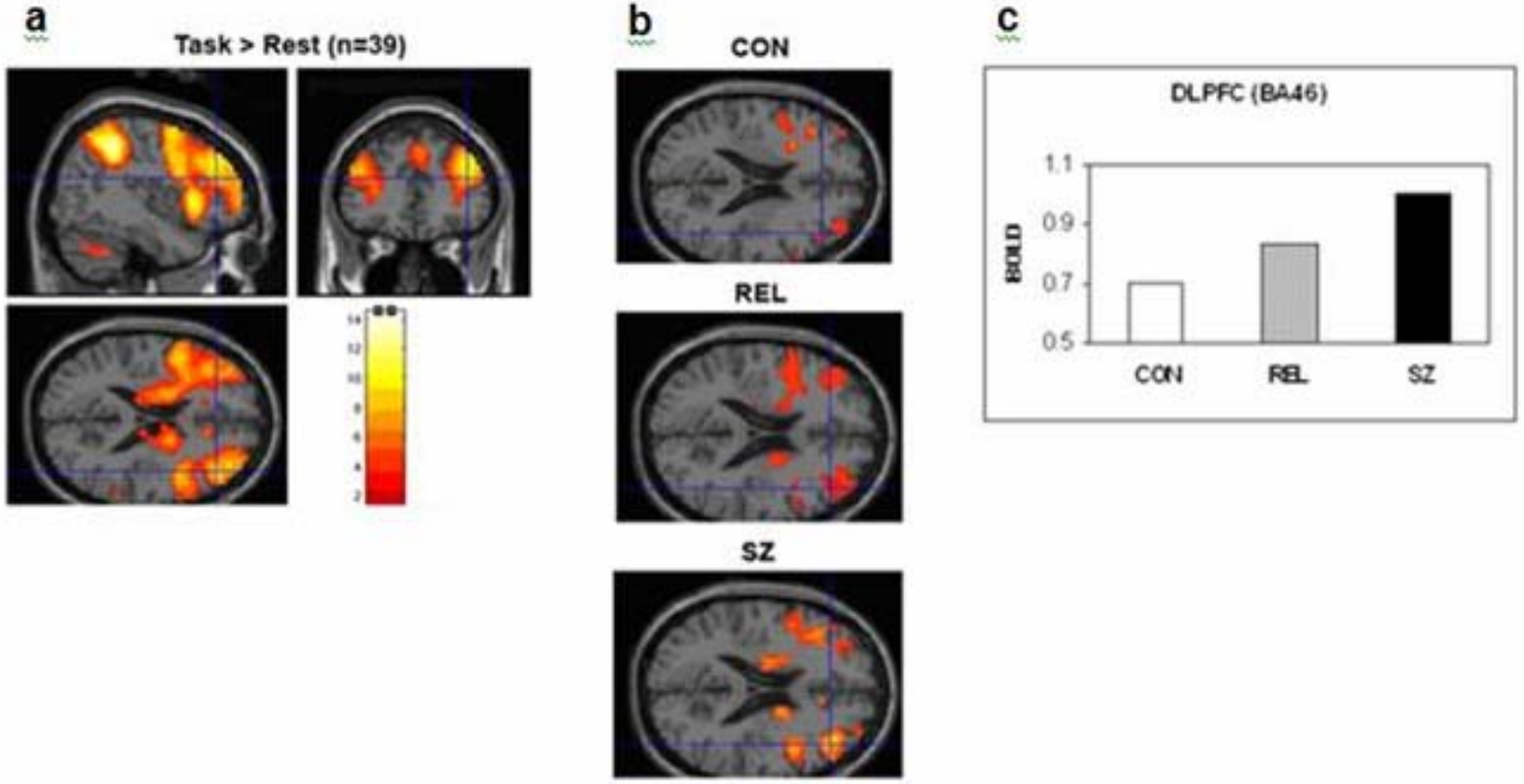
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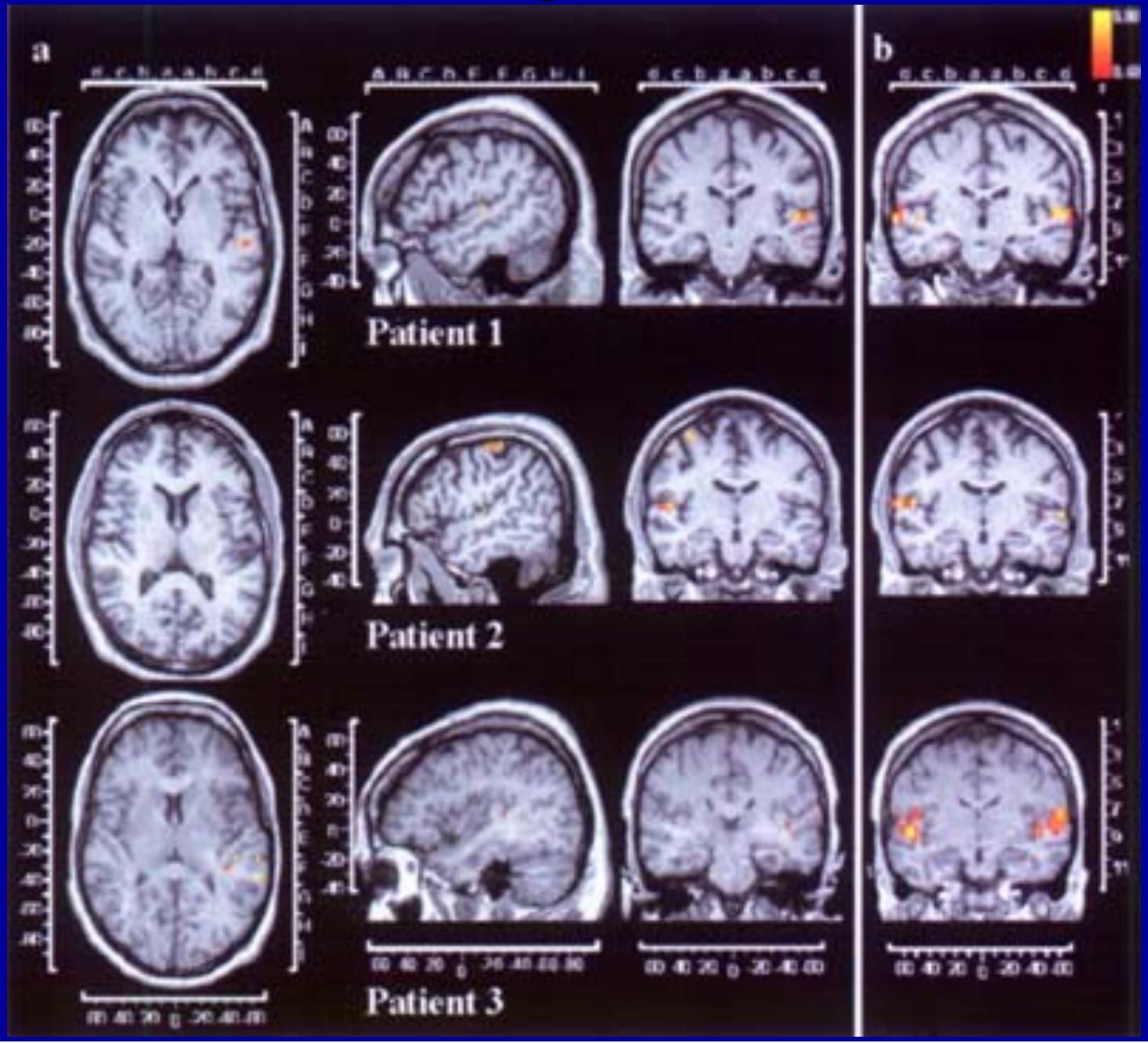
Working Memory Task

CONTROLS > PATIENTS, accuracy;
CONTROLS > RELATIVES, speed



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Auditory Hallucinations in Patients with Schizophrenia



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SCHIZOPHRENIA

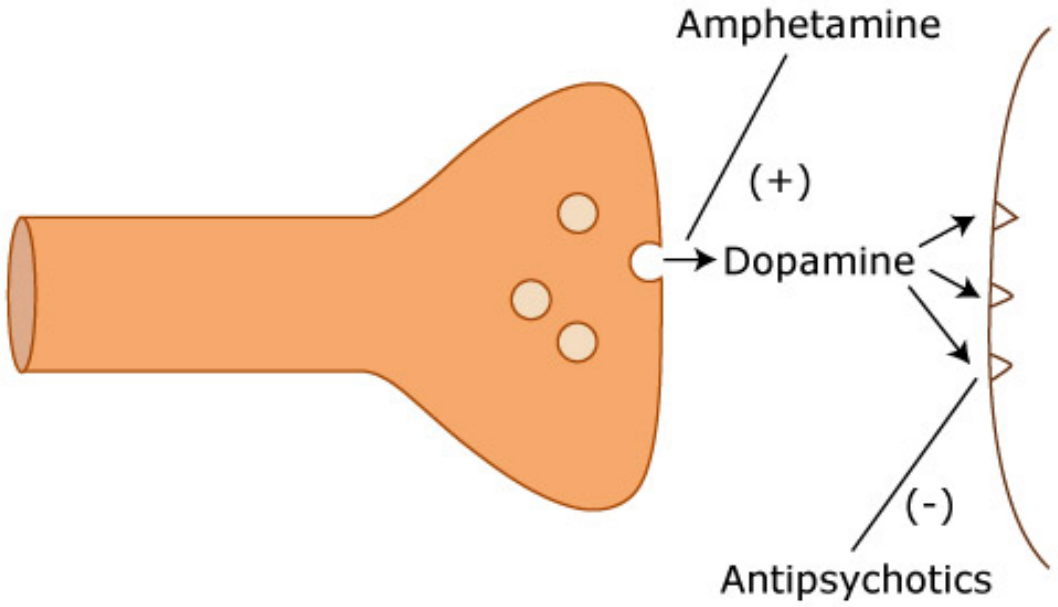
Treatment

- neuroleptics
 - block post-synaptic dopamine receptors & release of dopamine from presynaptic neurons
- drug is fully effective at receptors within hours but maximal clinical effect takes weeks and remain for weeks after treatment ends
- side effects
 - early on - parkinsonian symptoms (20-40%)
 - later on - tardive dyskinesia (20%)
 - abnormal involuntary movements - smacking lips, chewing, tongue protrusion
 - clozapine (late 1980s) – no tardive dyskinesia, but other risks including live function, reduction in white cells, must be monitored, expensive
 - behavioral therapy can enhance drug efficacy

Dopamine theory of schizophrenia

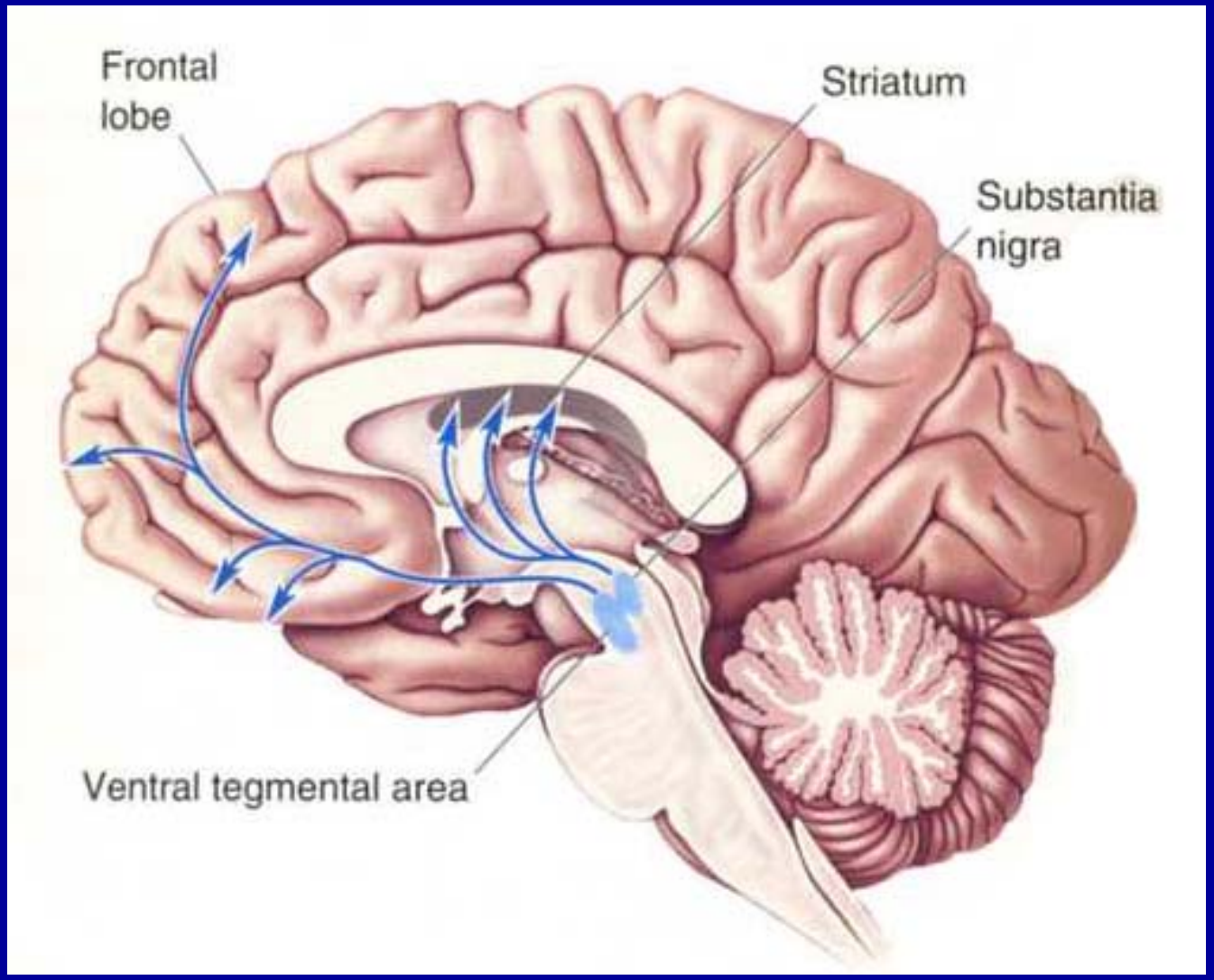
- antipsychotics
- amphetamine can induce something that looks like paranoid schizophrenia & it increases DA function
- weak & mixed results
- drug action vs. disease

Schizophrenia



Basis of the 'dopamine hypothesis' of schizophrenia. The diagram shows a dopamine synapse and the effects of drugs (amphetamine and antipsychotics) that lead to the proposal of a 'dopamine hypothesis'.

Image by MIT OpenCourseWare.



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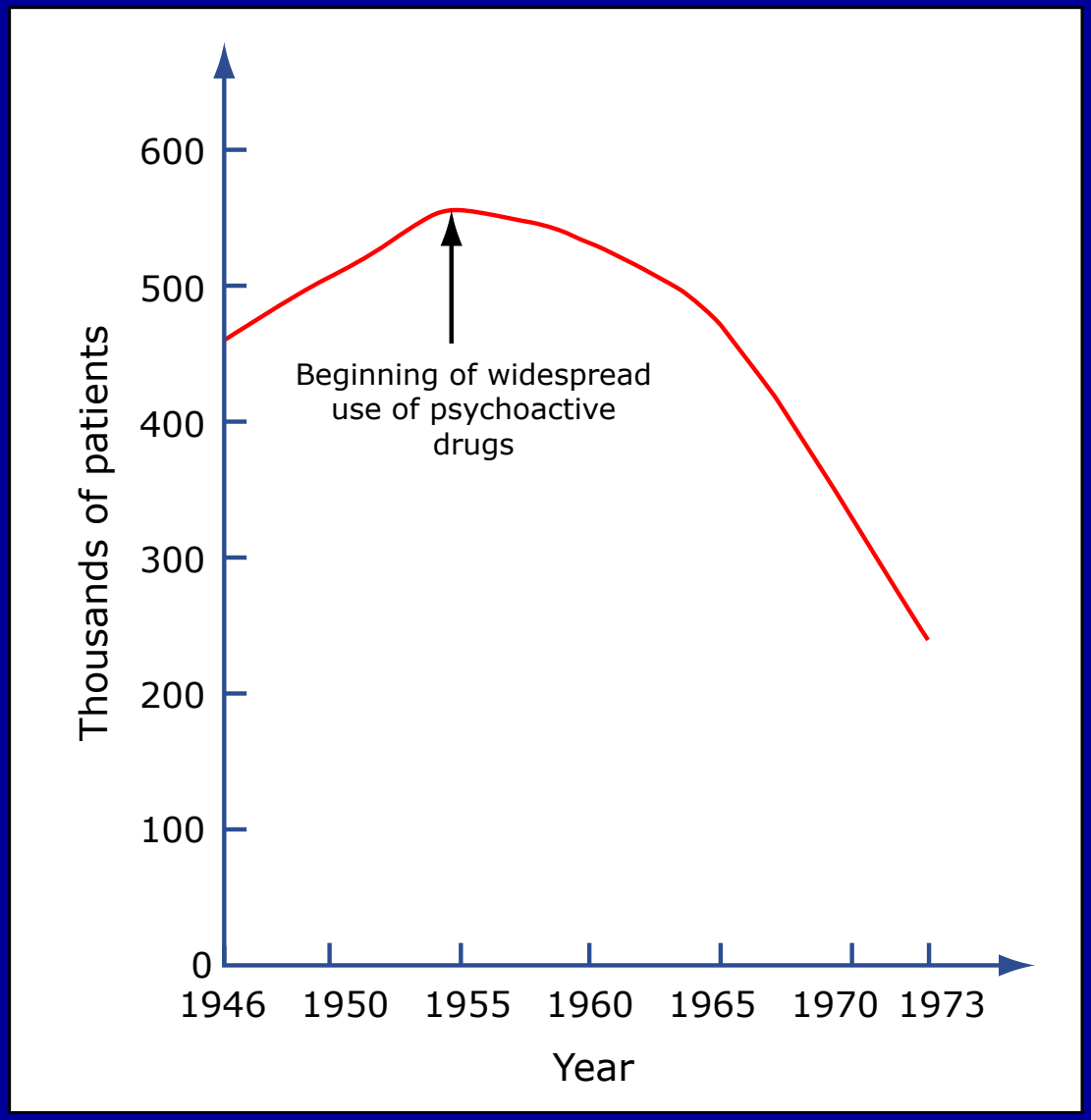


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9.00SC Introduction to Psychology
Fall 2011

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PSYCHOPATHOLOGY II

John Gabrieli

9.00

PSYCHOPATHOLOGY

- TREATMENT
- DEPRESSION (film)
- ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) (film)

TREATMENT

- Behavioral Therapy (Psychotherapy)
 - Psychoanalysis
 - Cognitive Behavioral Therapy (CBT)
- Psychopharmacology

Psychological Therapy

Psychotherapy is a social interaction in which a trained professional tries to help another person behave and feel differently.

Who Provides Psychotherapy?

Image of telephone directory pages removed due to copyright restrictions.

Includes listing headings for Psychics, Psychoanalysts, Psychologists, and Psychotherapists.

Psychiatrist



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Psychoanalyst



Courtesy of the Freud Museum, Vienna. Used with permission.

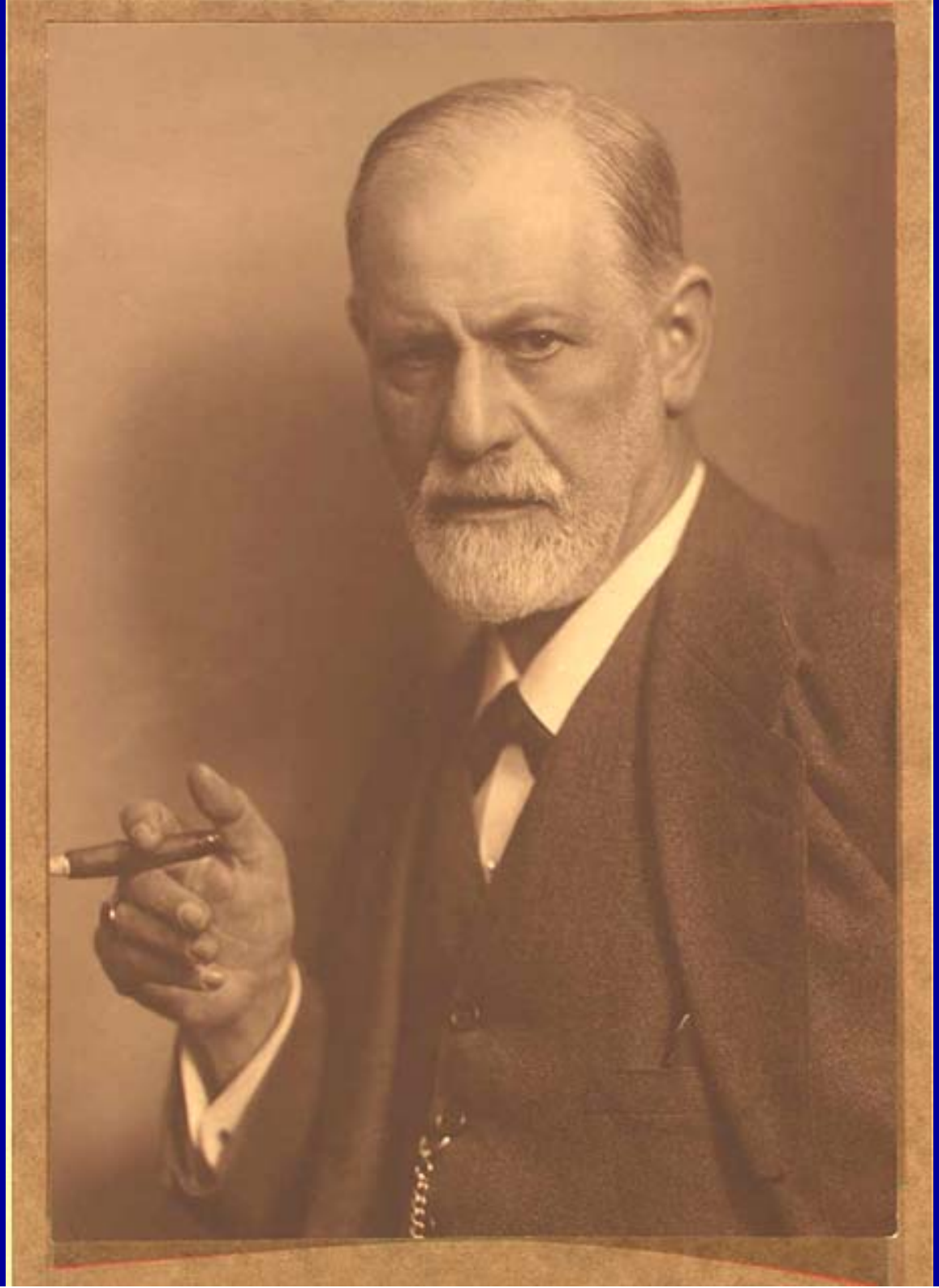
Freud & his couch, 1932

Other sources of psychotherapy

- Clinical Psychologist
- Counseling Psychologist
- Clinical Social Worker
- Clergy
- Peer Groups (e.g. AA)
- Self-help

Sigmund Freud

(1856-1939)



Public domain image
(1921, photo by
Max Halberstadt)

Types of Psychotherapy

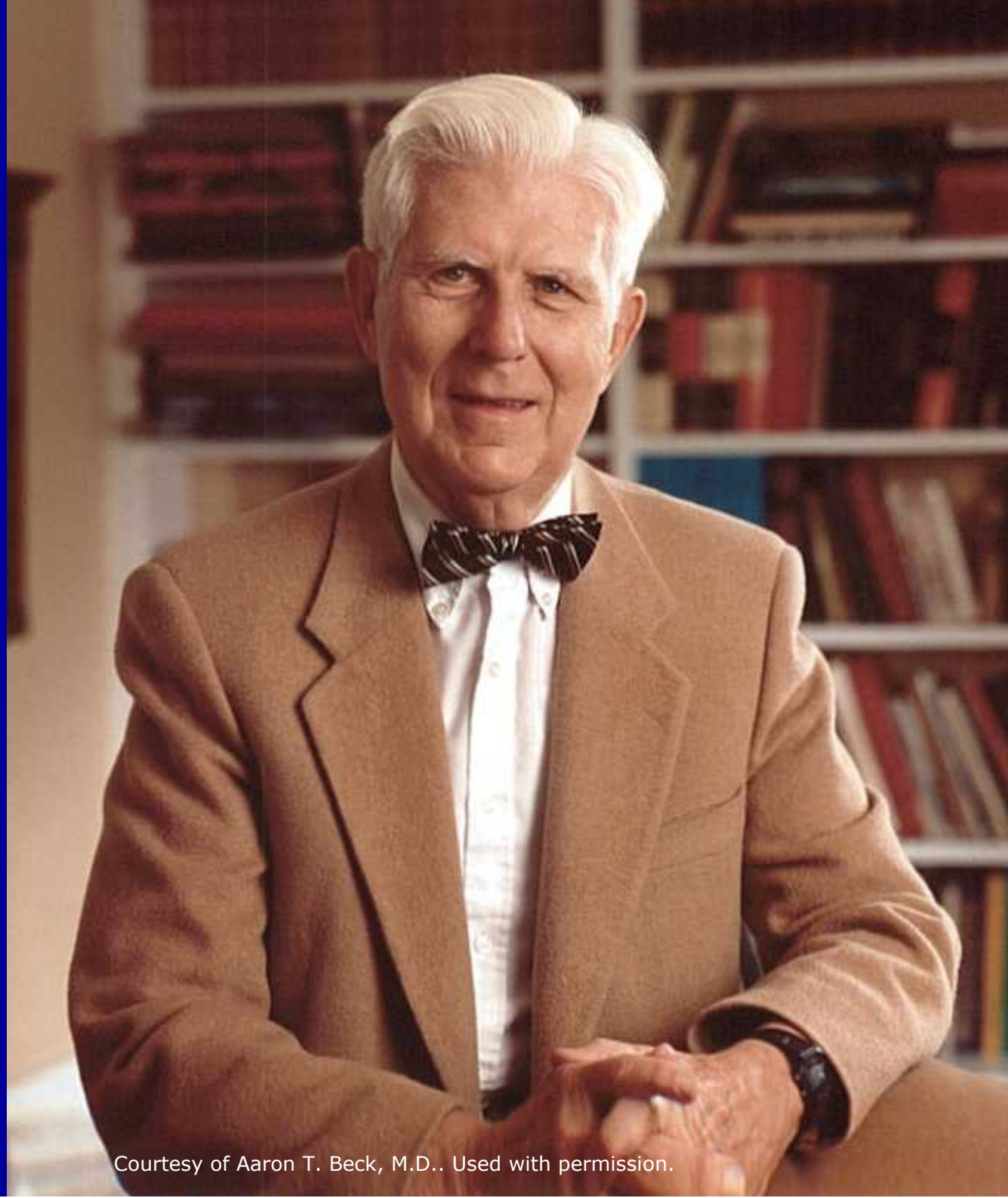
- Psychodynamic
 - Free association
 - Resistance
 - Transference
 - Interpretation
 - Corrective emotional experience

Aaron Beck

Born 1921

COGNITIVE BEHAVIORAL THERAPY - CBT

- –Dysfunctional beliefs
- –Logical errors in thinking maintain beliefs
- –Focus on current problems; strategies to help
- –Time-limited



Courtesy of Aaron T. Beck, M.D.. Used with permission.

Does Psychotherapy Work?

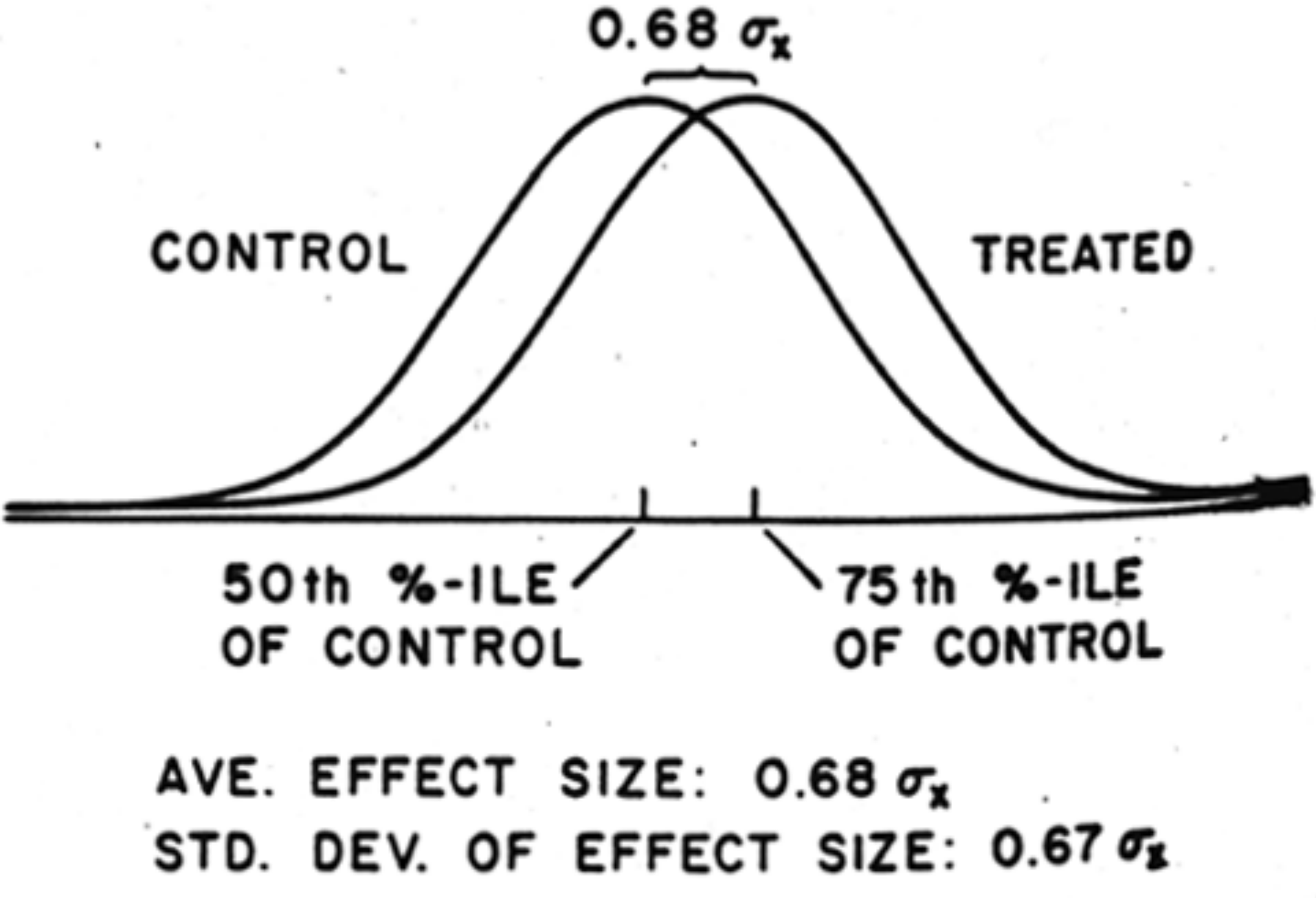
- Initial pessimism (Eysenck 1952)
- Cautious optimism (Smith, Glass, & Miller, 1980)

Meta-Analysis

- Quantitative method for averaging results of a large number of different studies.

- Unit of analysis is the **effect size**, arrived at by subtracting the mean of the control group from the mean of the treatment group and dividing that different by the standard deviation of the control group.

- The larger the effect size, the greater the effect of therapy.



Courtesy of the American Psychological Association. Used with permission. Source: Smith, M. L., and G. V. Glass. "Meta-Analysis of Psychotherapy Outcome Studies." *American Psychologist* 32, no. 9 (1977): 752-60.

Meta-Analysis of Psychotherapy Effectiveness (Smith, Glass, & Miller, 1980)

- The average person (50th %ile) receiving psychotherapy was better off than 80% of the persons who did not receive therapy.

- Only about 10% of effect sizes were negative → deterioration due to psychotherapy was infrequent.

- Different types of therapy were equally effective, but some advantage to cognitive and behavioral therapies.

WHEN DOES PSYCHTHERAPY WORK?

Random assignment

Psychotherapy

- Wait-list
- Blind and double-blind

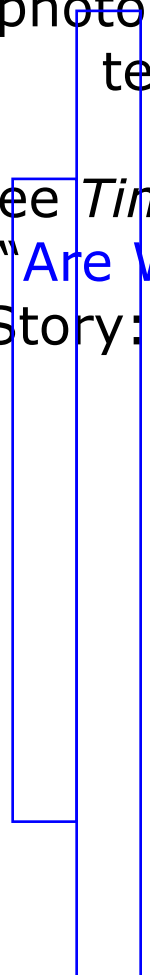
Meta-analysis of good efficacy of psychotherapy studies

- 2:1 chance of improvement vs. control
- Credentials (Ph.D., M.D., no degree) did not matter
- Experience of therapist did not matter
- Type of therapy did not matter
- Length of therapy did not matter

Table removed due to copyright restrictions.

Twelve current psychiatric medications (e.g. Zoloft, Paxil, Depakote): photo of pill, how it works, side effects, and testing/approval status.

See *Time* Magazine, Dec. 8, 2003.
Cover: "Are We Giving Kids Too Many Drugs?"
Story: "Medicating Young Minds"



Obsessive Compulsive Disorder (OCD)

- anxiety disorder
- *obsessions* - recurrent, unwanted thoughts
- *compulsions* - repetitive behaviors

 handwashing, counting, checking, cleaning

http://www.youtube.com/watch?v=Rn1OYIYzgm8

OCD Treatment Study Results

Data from Foa, E. B. et al. *Am J Psychiatry* 162, no. 1 (2005): 151-161.

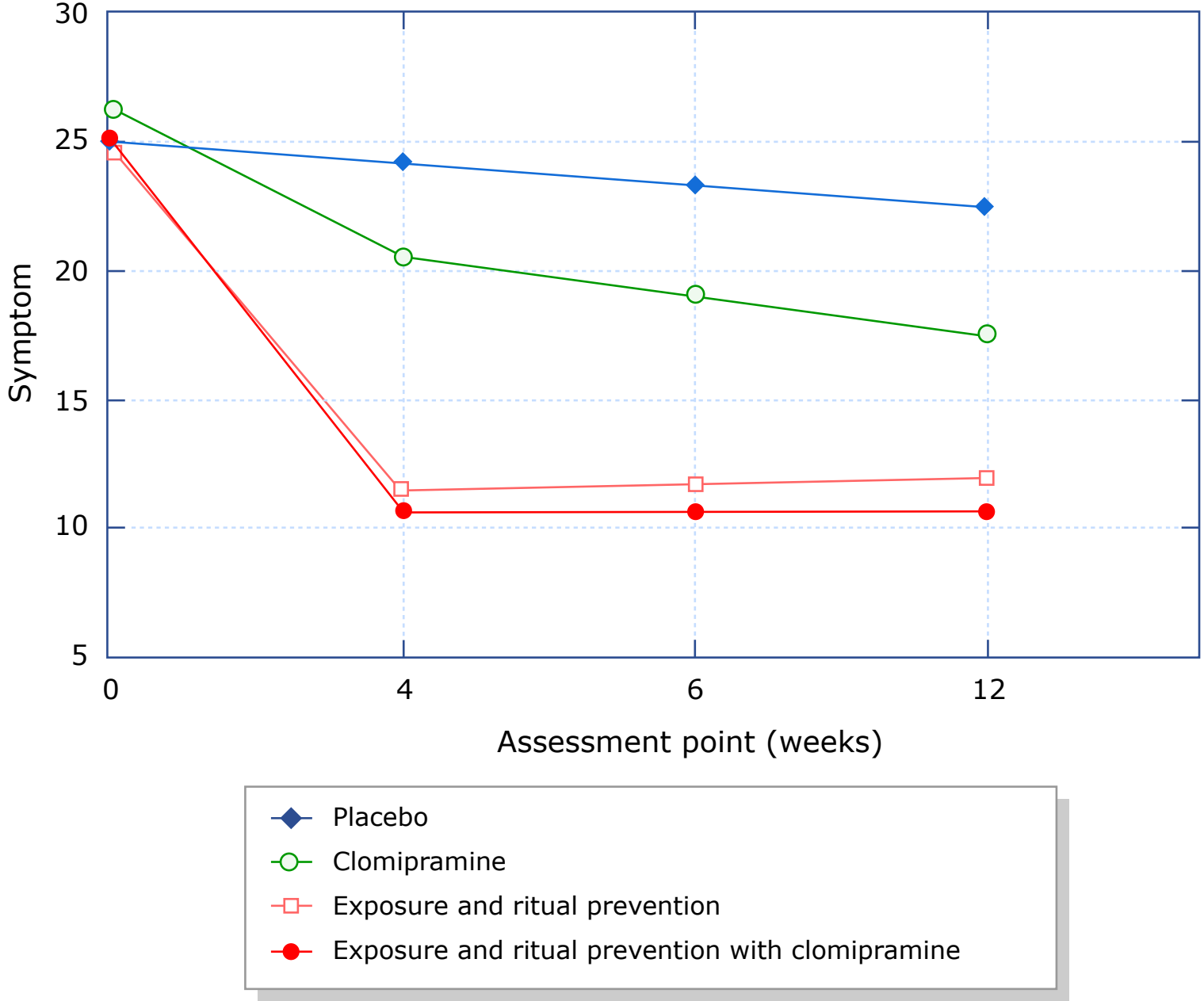


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Effectiveness of Antipsychotic Medications and Therapy

Adapted from Hogarty, G. E., et al. *Archives of General Psychiatry* 43 (1986): 633-642.

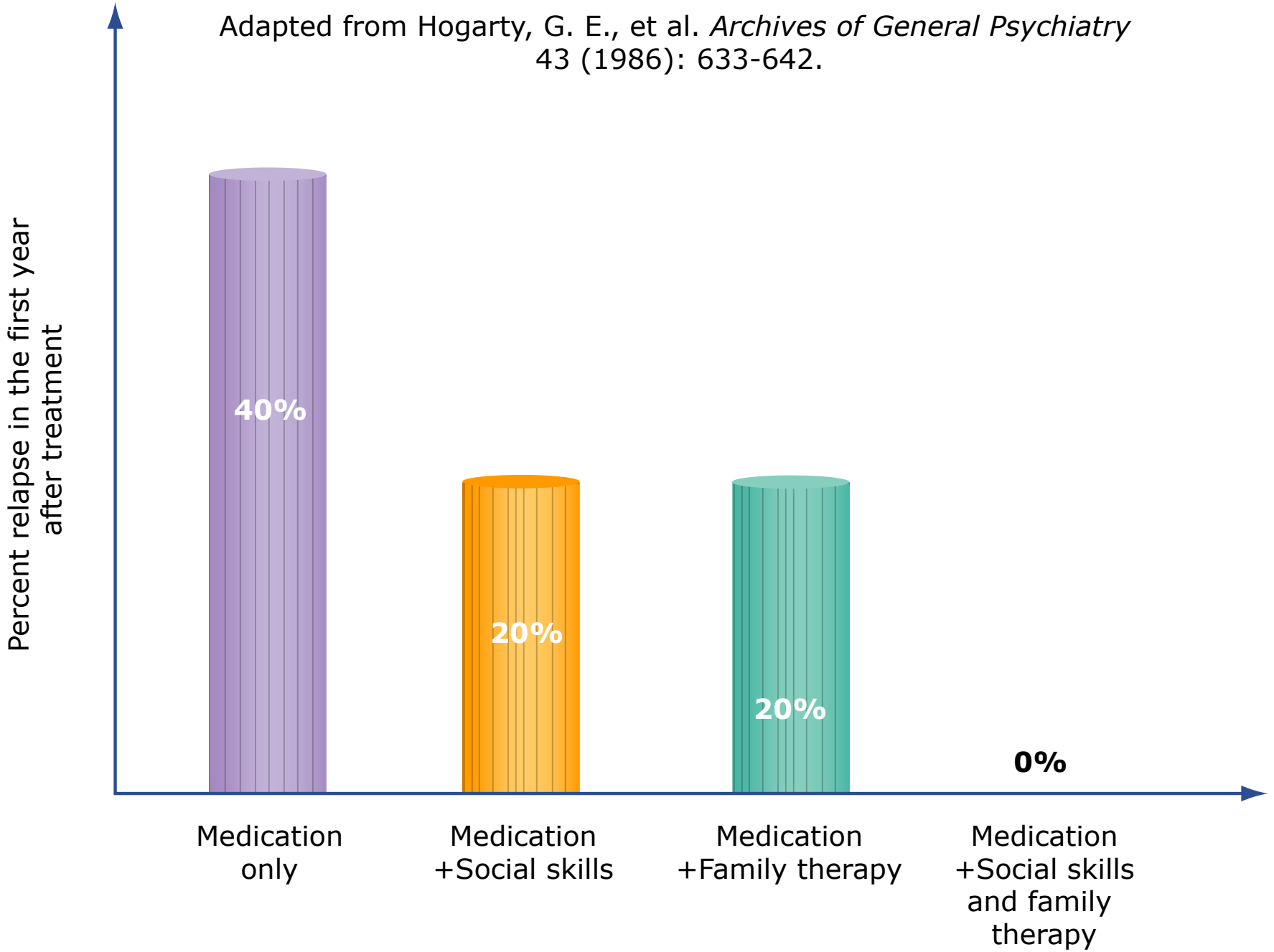
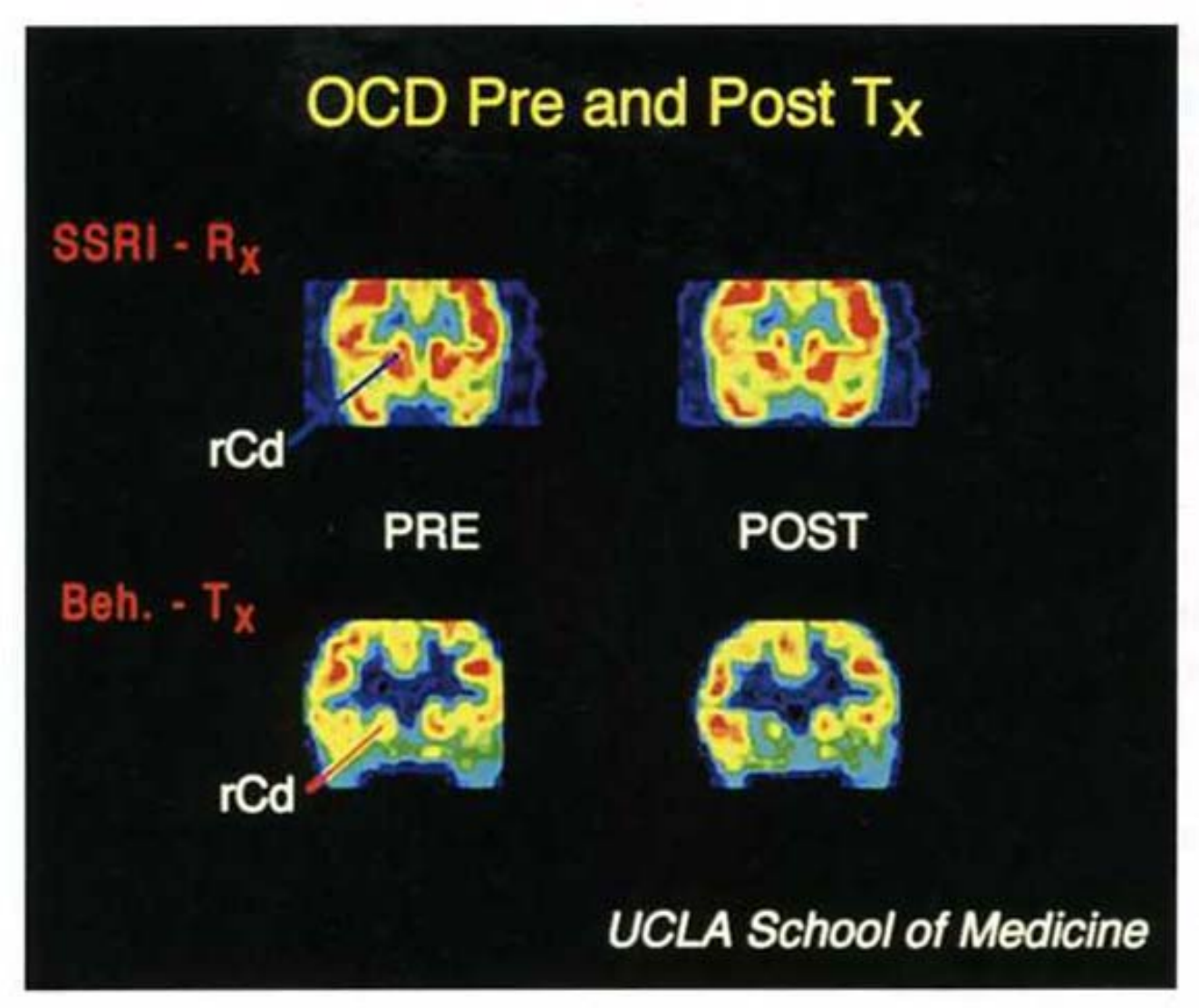


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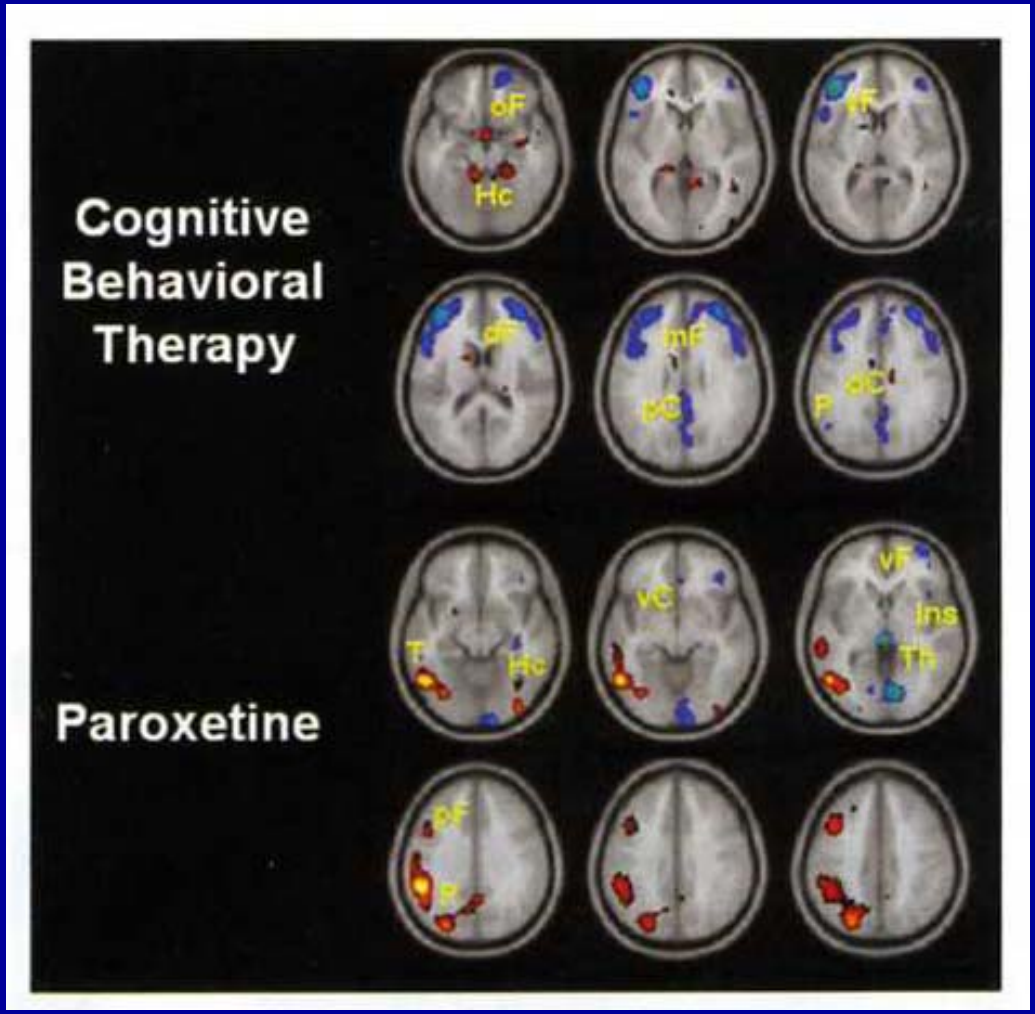
PET Scans of OCD Patients



Basal ganglia shows similar changes with psychotherapy and drug therapy.

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Depression: Brain Activity after CBT and Medication Treatments



Different therapies produce different brain activity results. (Orange = increased activity; blue = decreased activity)

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DEPRESSION

- fearful, gloomy, helpless, hopeless
- Hamlet "How weary, stale, flat, and unprofitable seem to me all the uses of this world"
- Typical episode is 4-12 months (if untreated) - pervasive dysphoria - intense mental pain, anhedonia (inability to feel pleasure), generalized loss of interest
- 5% of world's population - 8 million in U.S.
- average age of onset is 30, but wide spread - often unnoticed in young - rare to have first episode after 60
- women 2 or 3 times the rate of men
- about 70% who have an episode will have another

DEPRESSION

- diagnosis requires also at least 3 of the following for a period
 - disturbed sleep
 - diminished appetite
 - loss of energy
 - decreased sex drive, restlessness
 - slow thoughts/actions
 - poor concentration, indecisiveness
 - feelings of worthlessness
 - guilt
 - pessimism
 - fixation on death or suicide
- Genetic predisposition: Monozygotic twin concordance = 50%; dizygotic = 10% (same as siblings); Environmental - since 1940, a nearly 10-year drop in average age of first incidence

Video clips played in class from
Depression: Beyond the Darkness. Narrated by Hugh Downs. ABC-TV, episode of *20/20*, airdate August 31, 1990. VHS. MPI Home Video, 1990.

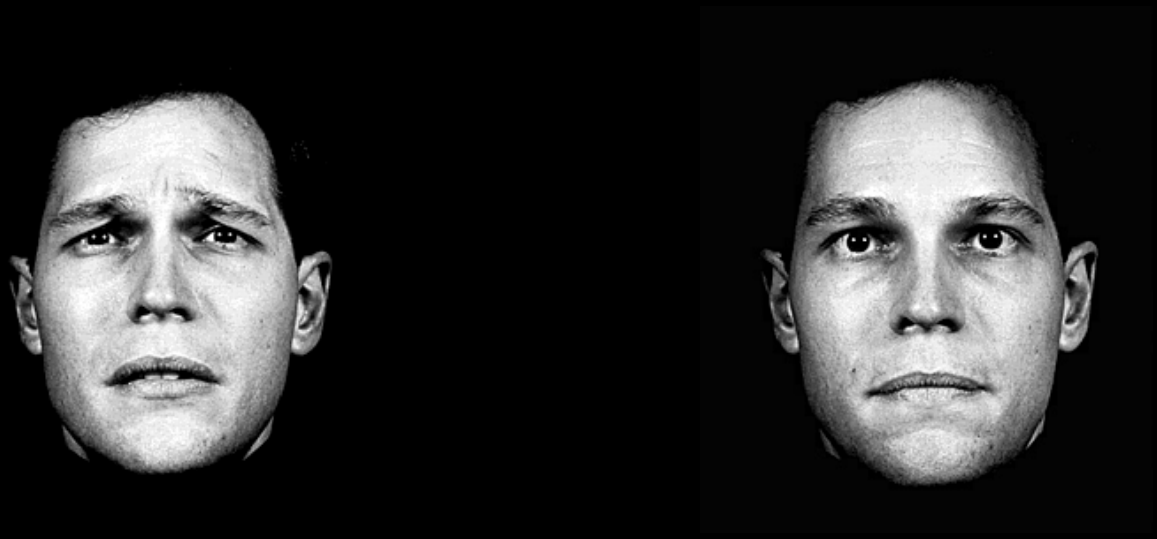
DEPRESSION

- dot probe task of attentional allocation
 - biased attention to sadness in depression
 - risk for depression or consequence of depression?



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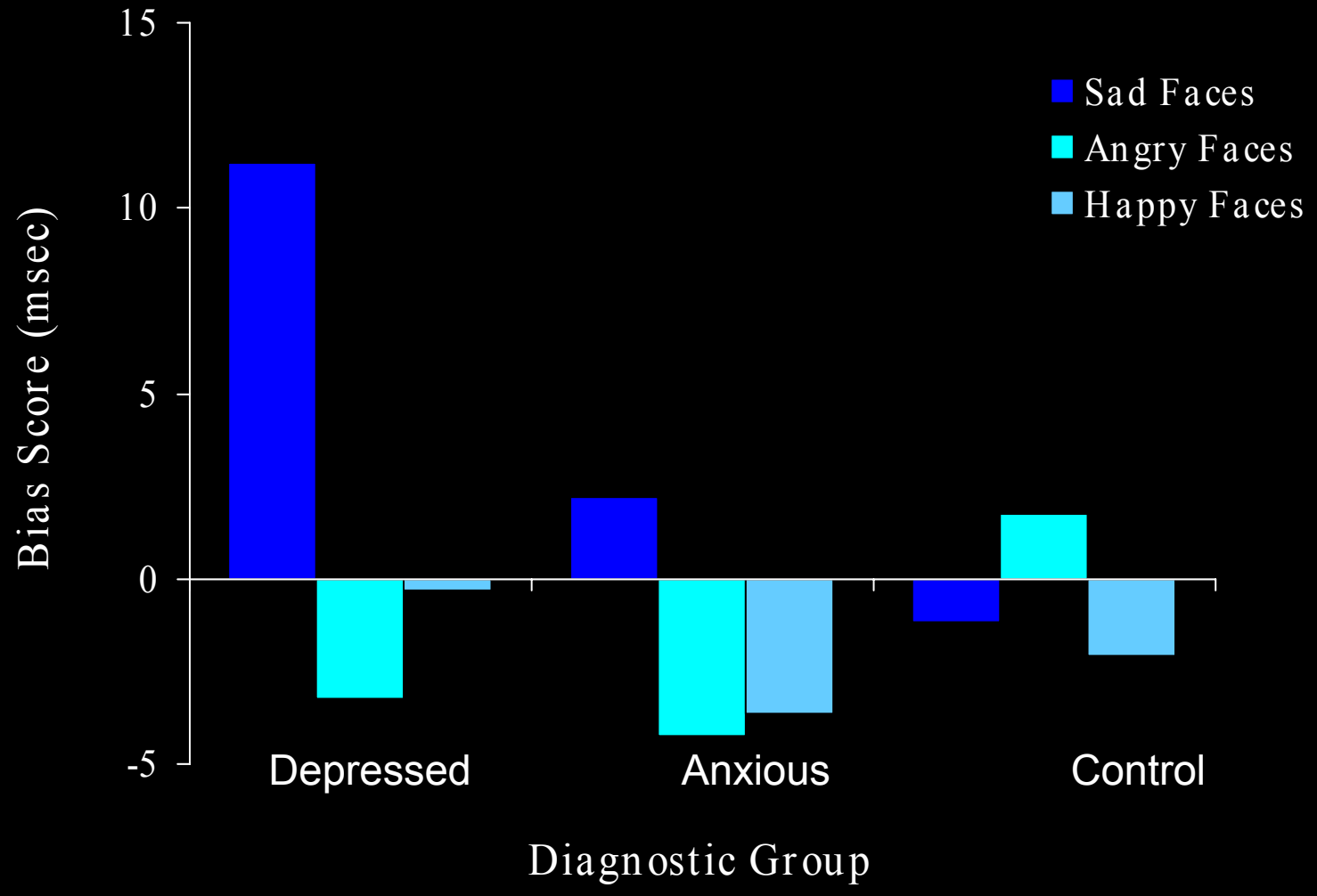
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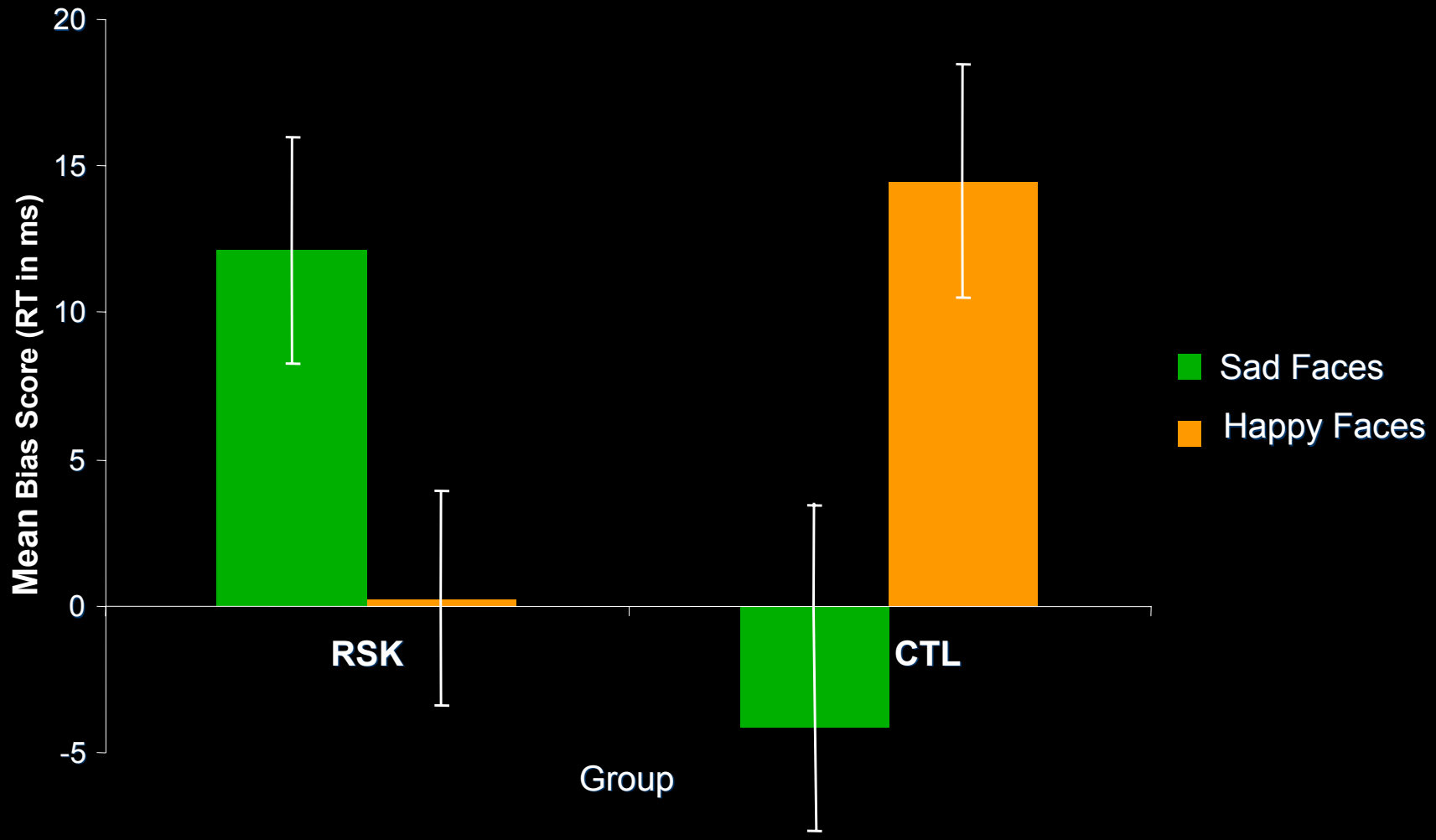
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Attentional Biases for Sad, Angry, and Happy Faces



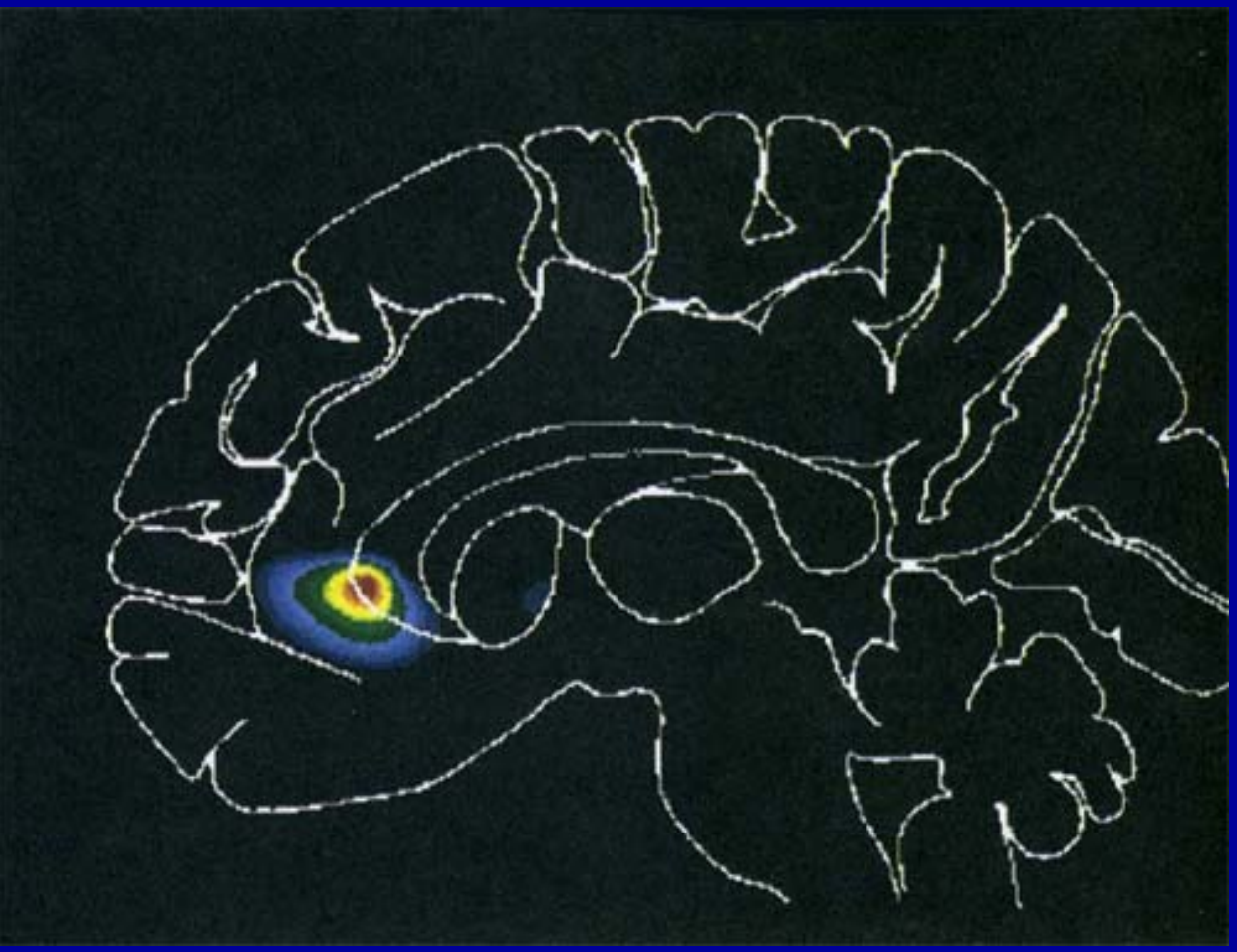
Courtesy of Ian Gotlib. Used with permission.

Attentional Biases for Sad and Happy Faces in High-Risk and Low-Risk Girls



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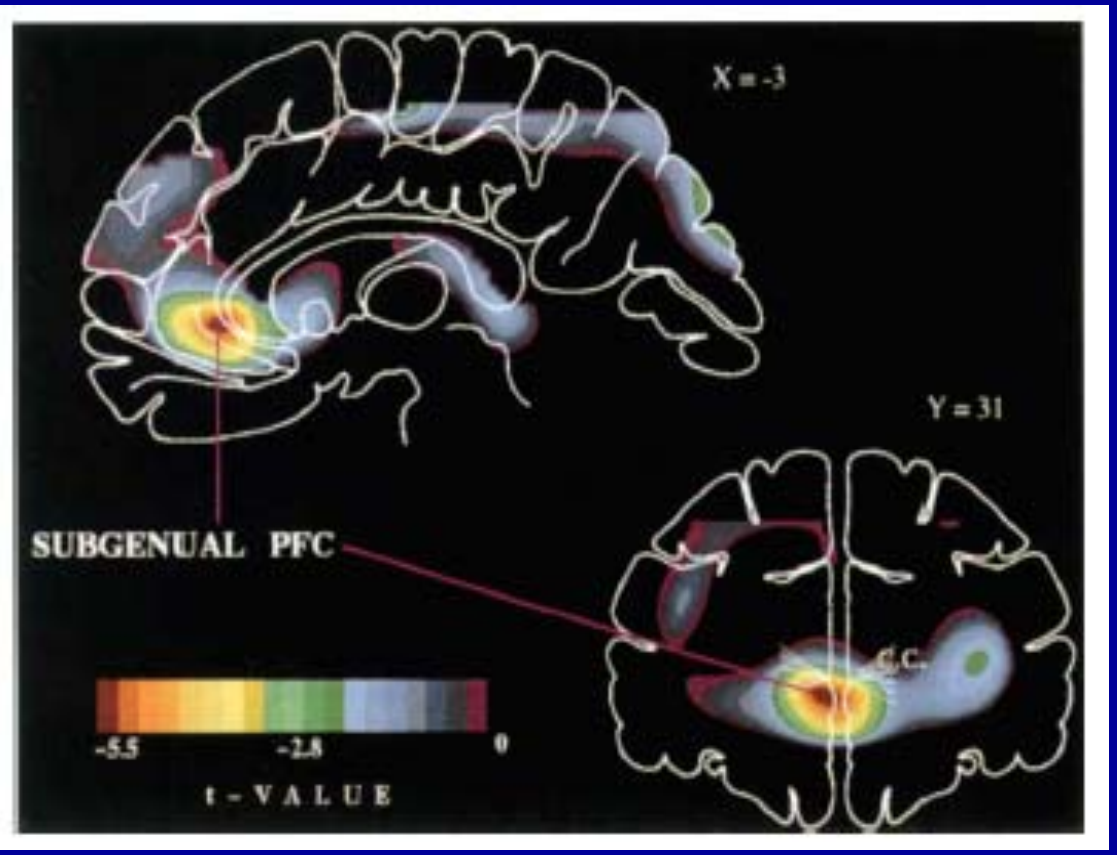
DEPRESSION & SUBGENUAL ANTERIOR CINGULATE

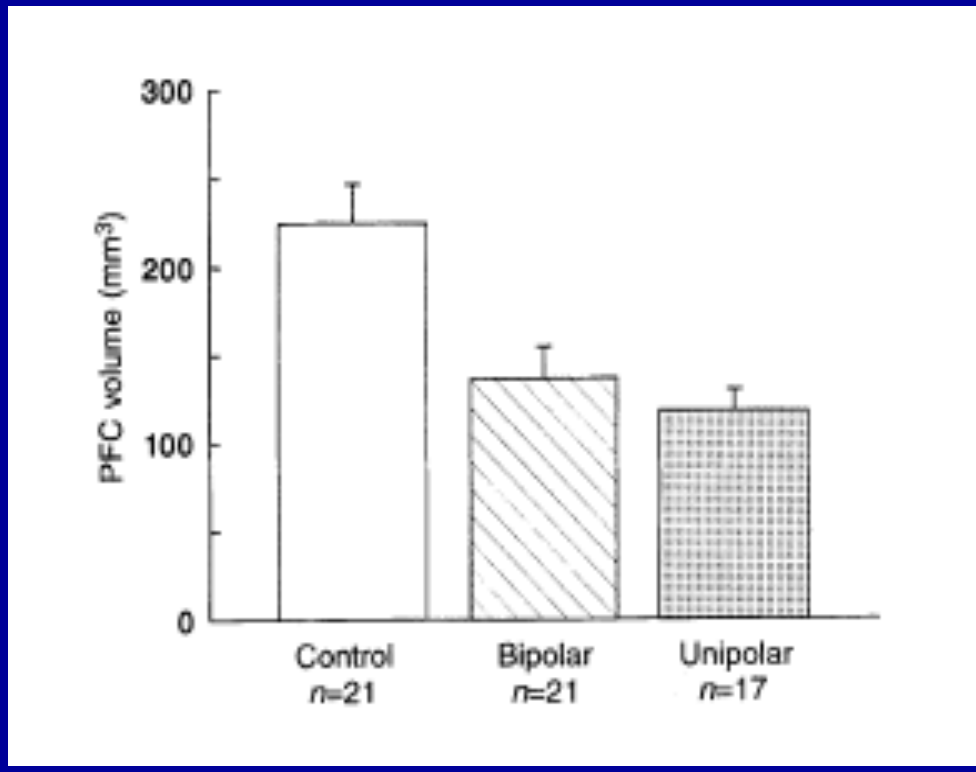


This PET scan was also produced by subtracting scans of normal subjects from scans of depression patients. It reveals a tiny area buried deep along the midline in the frontal lobe (also known as the orbitofrontal cortex because of its position just above and behind the eyes) which may play a key role in the symptoms of depression. Here it exhibits reduced metabolism in patients with depression.

Courtesy of Wayne Drevets. Used with permission.

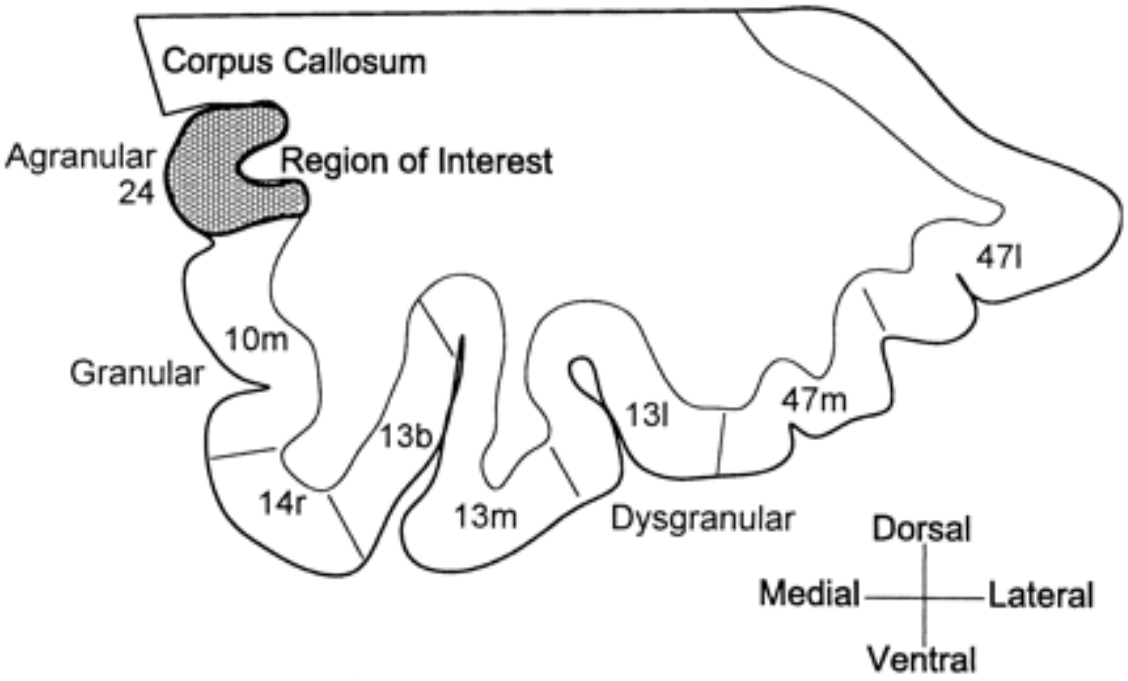
REDUCED BRAIN VOLUME IN DEPRESSION IN SUBGENUAL ANTERIOR CINGULATE

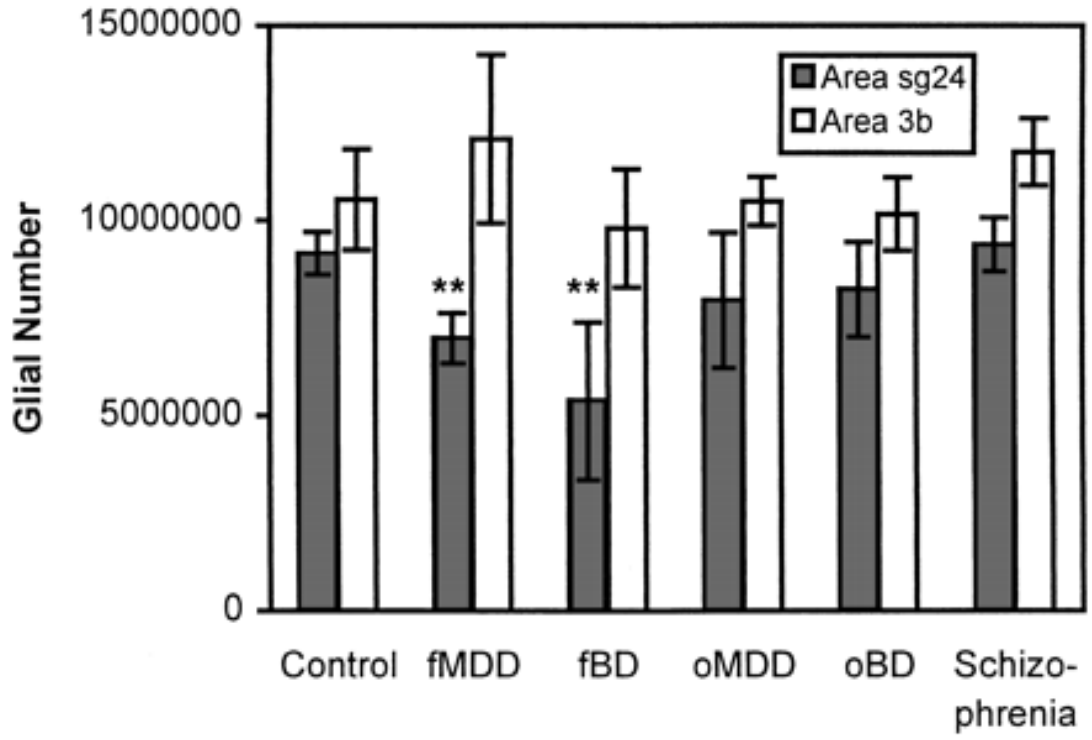




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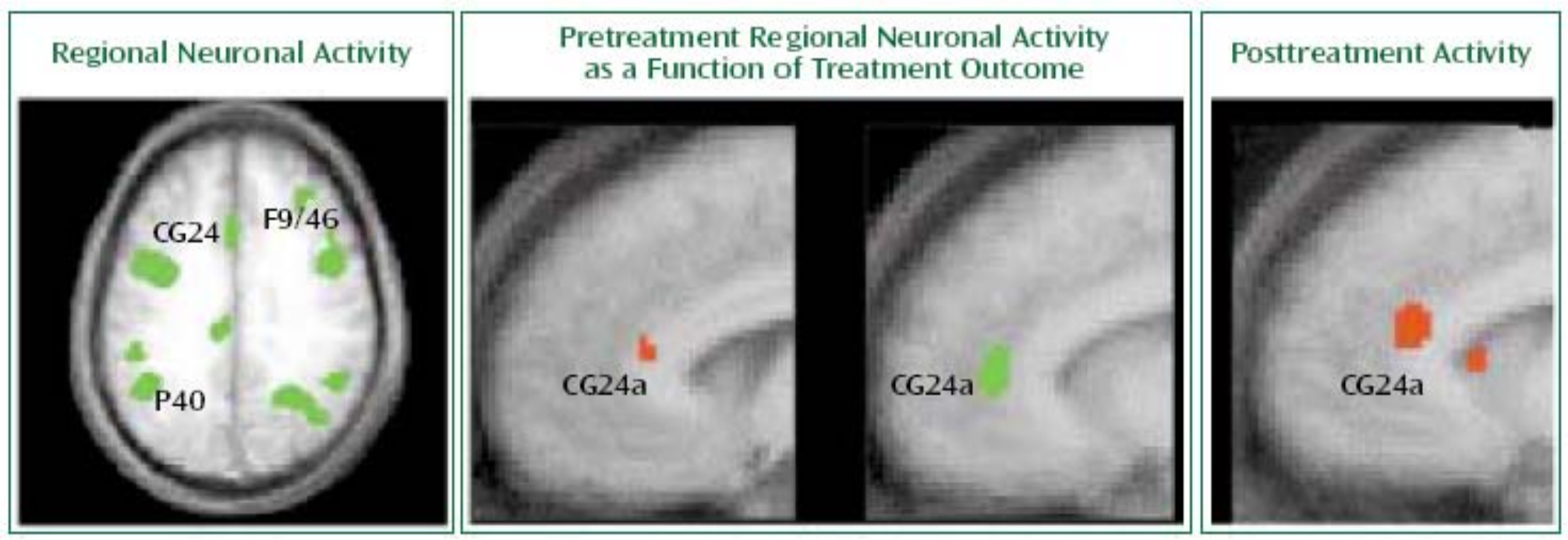
REDUCED NUMBER OF GLIAL CELLS IN SUBGENUAL ANTERIOR CINGULATE CORTEX IN DEPRESSION (no change in neurons)





Courtesy of National Academy of Sciences, U. S. A. Used with permission. Source: Öngür, D., W. C. Drevets, and J. L. Price. "Glial Reduction in the Subgenual Prefrontal Cortex in Mood Disorders." *PNAS* 92, no. 22 (1998): 13290-5. Copyright © 1998 National Academy of Sciences, U.S.A.

RELATION OF ACTIVATION IN SUBGENUAL ANTERIOR CINGULATE CORTEX TO DRUG TREATMENT OUTCOME



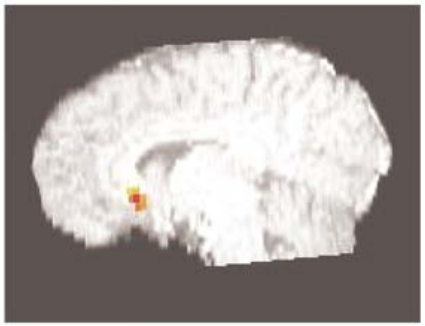
BETTER OUTCOME **WORSE OUTCOME** **AFTER TREATMENT**

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Tamminga et al., Am J Psychiatry, 2002

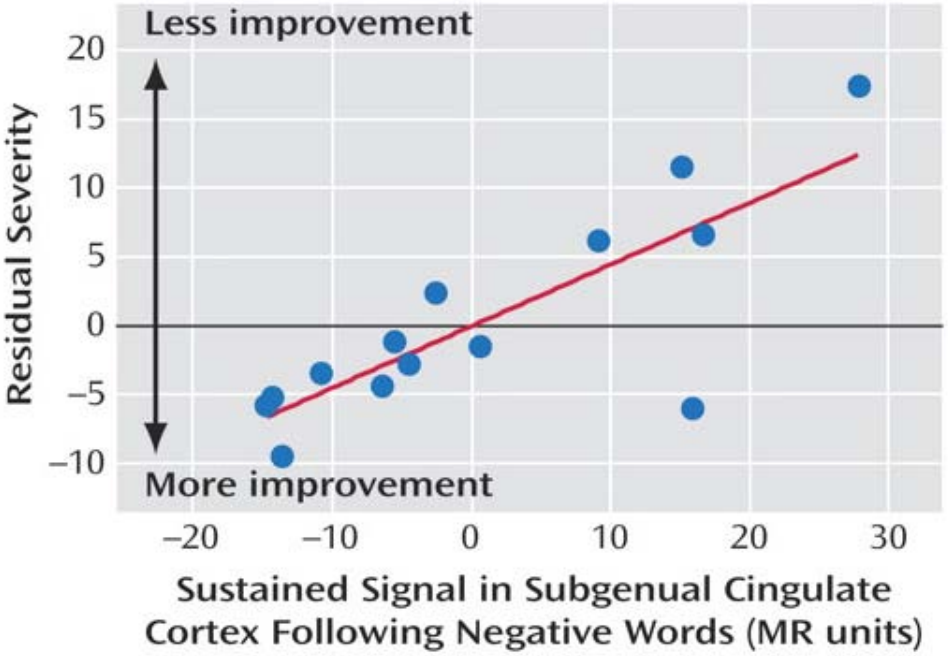
PREDICTING CBT OUTCOME IN DEPRESSION

A. Region Examined

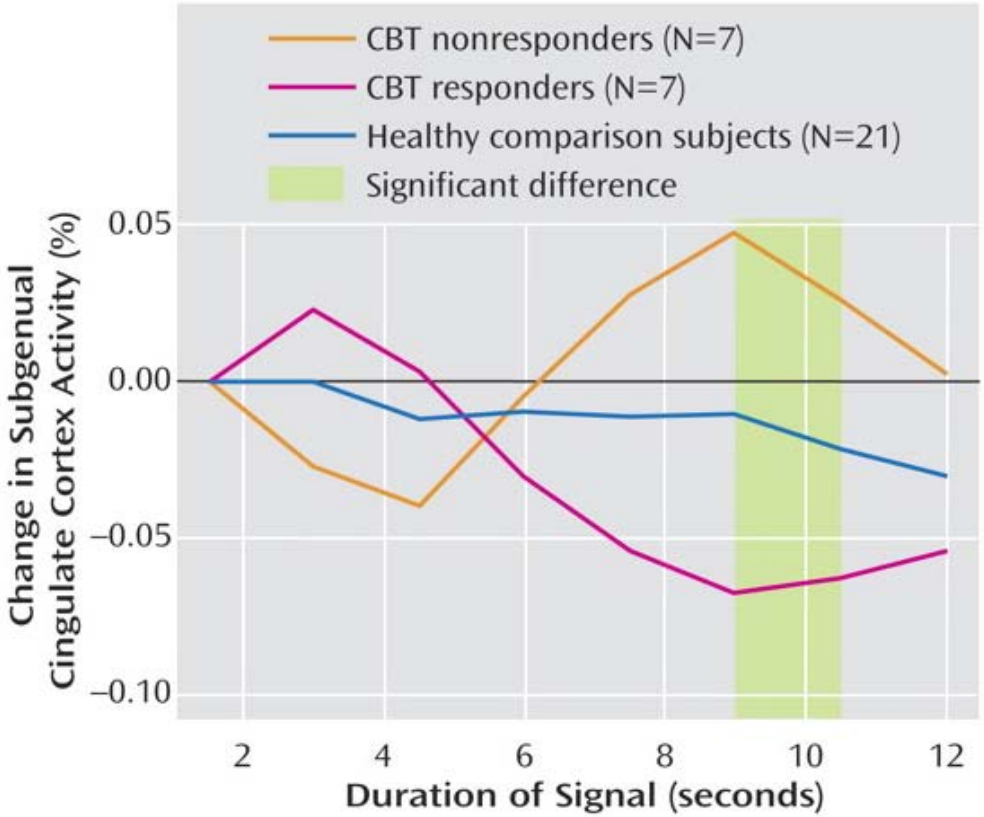


Subgenual Cingulate Cortex

B. Relationship Between Regional Reactivity to Negative Words and Residual Depressive Severity Following Treatment With Cognitive Behavior Therapy



C. Regional Reactivity to Negative Words in Patients With Unipolar Depressression, by CBT Response Status, Relative to Healthy Comparion Subjects



Source: Siegle, G. J., et al. "Use of fMRI to Predict Recovery From Unipolar Depression With Cognitive Behavior Therapy." *Am J Psychiatry* 163 (2006): 735-8. © American Psychiatric Association. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Treatment for Depression

- medications (27 million people in US 2005, $9.6 billion in 2008 sales)
- CBT

Current Treatment for Depression is Suboptimal

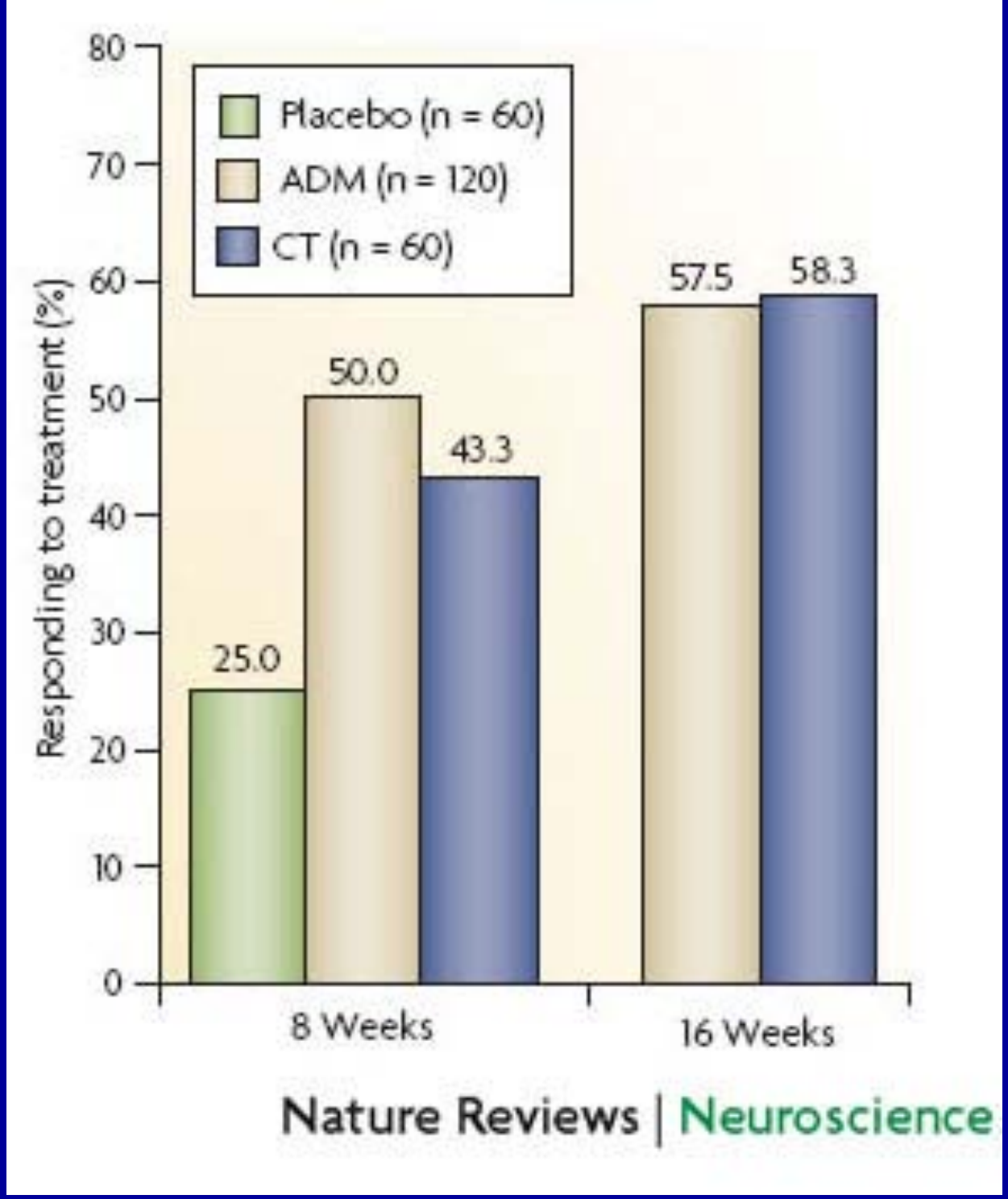
- **Only partially effective**

 As many as ½ of patients do not achieve remission (Petersen et al., 2005)

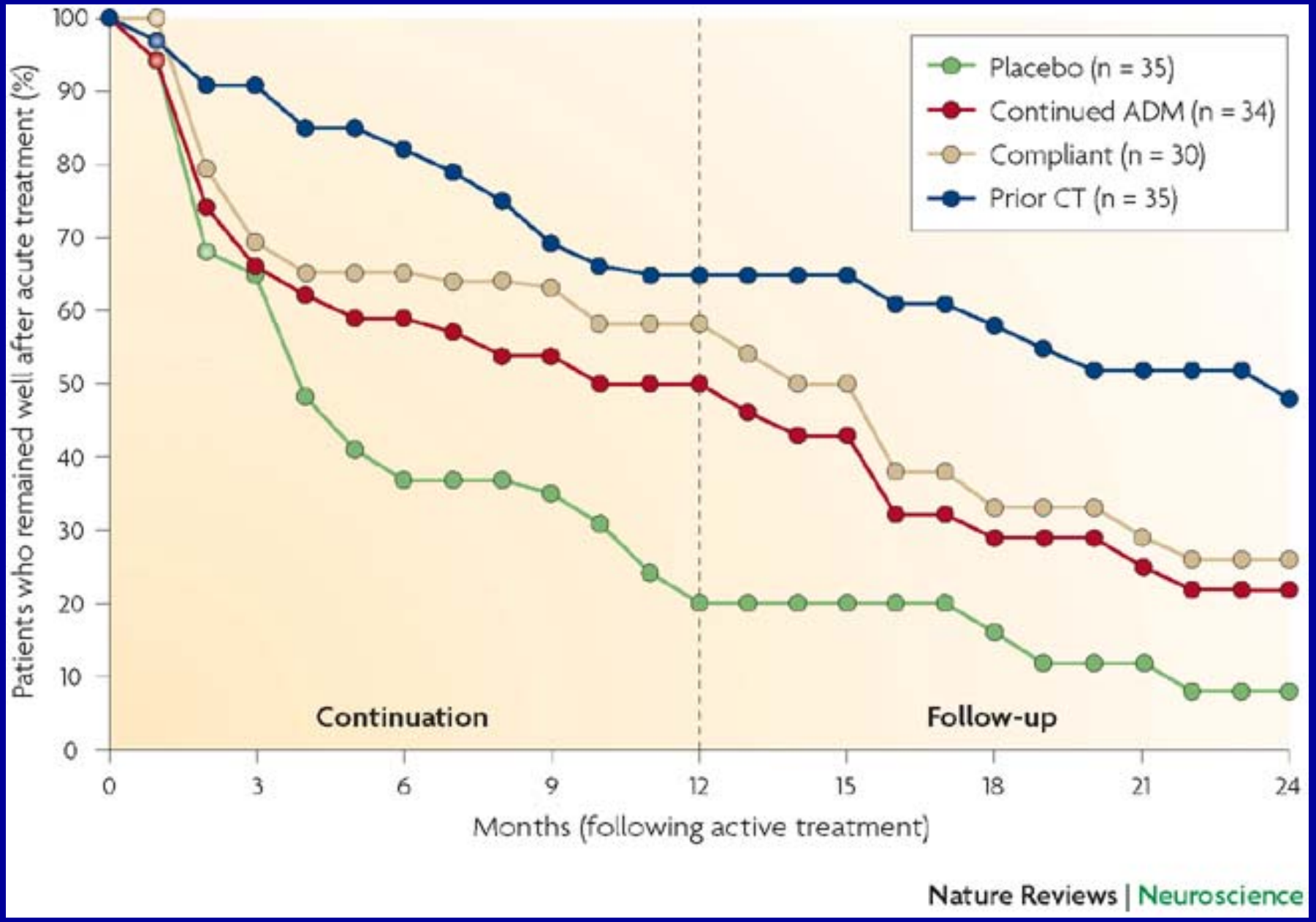
 Residual symptoms are common among patients achieving remission (Nierenberg, 1999)

- **Trial and Error**

 Selecting correct treatment takes months, causing attrition



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Treatment for Depression

- clinical trials

 drug – random assignment, double-blind with placebo

 outcome – response vs. remission

 interviews – physician – Hamilton Depression Rating Scale

 strong placebo response

 regression to the mean from study entry?

 real response to placebo?

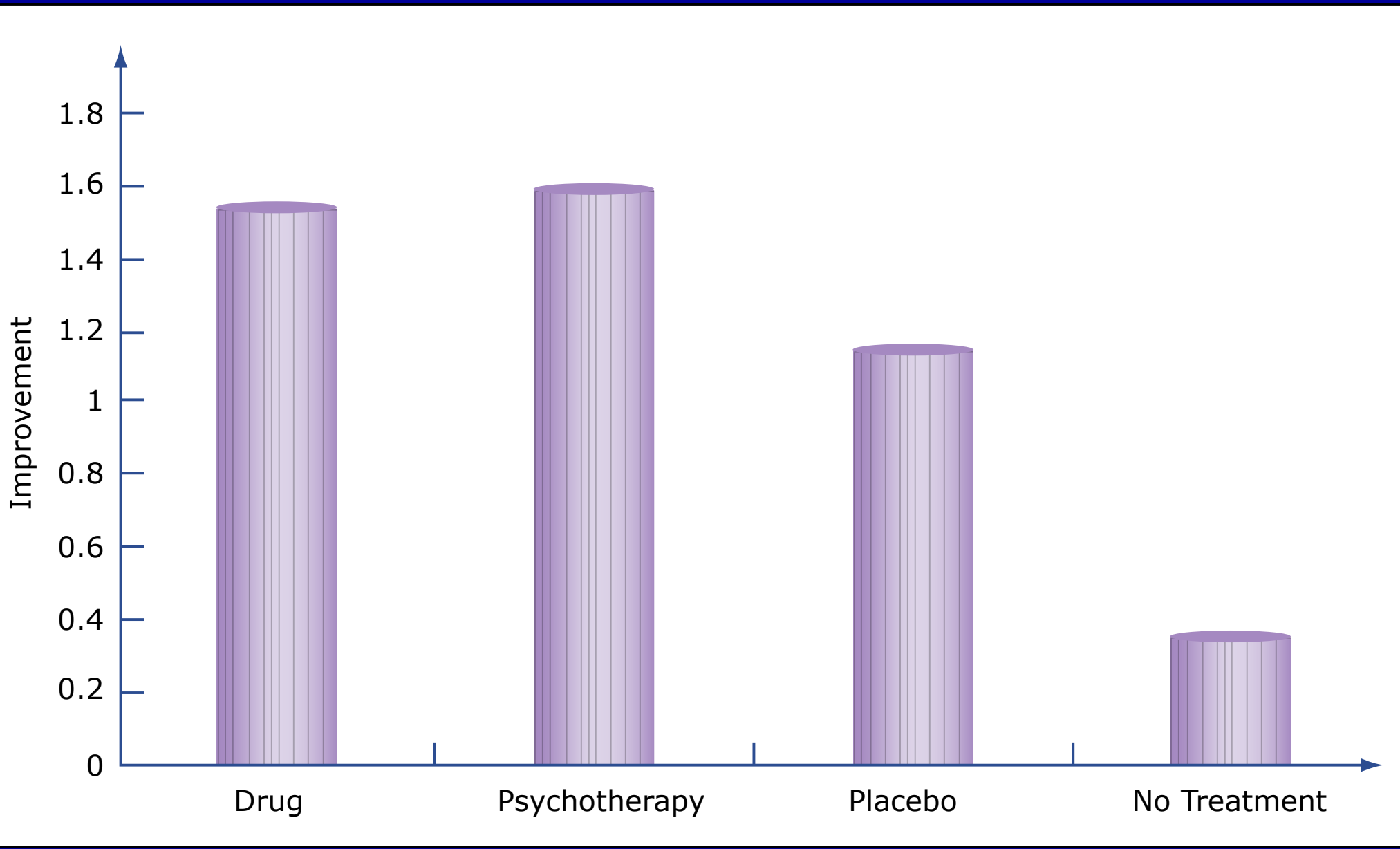


Image by MIT OpenCourseWare.

Treatment for Depression

recent meta-analyses

- Kirsch – no effect of drug (above placebo, about 75% of effect) – apparent difference is due to patients realizing they are on active drug from side effects – greater side effects associated with better drug response (80% of patients guess correctly they are on drug) – no drug/placebo difference if placebo causes side effects

- Fournier – little or no drug benefit above placebo for mild-to-moderate or severe depression; benefit for patients with very severe depression

ATTENTION DEFICIT DISORDER (ADHD/ADD)

- INATTENTION
- HYPERACTIVITY (80%)
- IMPULSIVITY
- DIAGNOSIS by exclusion
- PREVALENCE 2 million in US
 tripled since 1981
 increased 2.5 times since 1990

How Do Clinicians Make The Diagnosis?

- History from parents and physical exam
- Collection of data from school and parents using questionnaires

Prevalence of ADHD

- Ranges from 1.7 to 16.1% in various studies
- Different diagnostic methods have been used to establish the prevalence
- Different DSM manuals - DSM III, DSM IIIR, and now DSM IV
- Different settings - by country, by profession
- Wolraich – same German population, incidence changed from 6 to 12% DSM 3R to DSM 4

Attention Deficit Hyperactivity Disorder (ADHD)

- PREVALENCE: 3 - 5% of school-age children

- Impairs social and academic adjustment in childhood
 - predicts antisocial behavior, substance abuse and adverse occupational and social adjustment in adulthood

- TREATMENT: Stimulants, e.g. methylphenidate (Ritalin)

- ETIOLOGY: genetic
 - rates among relatives of probands - 7 times
 - twin studies - .76 heritability
 - candidate genes - dopaminergic

DIAGNOSTIC CRITERIA

- **INATTENTION** (> 6 for at least 6 months to a degree that is maladaptive and age-inappropriate)
 - careless mistakes in schoolwork or other activities
 - difficulty sustaining attention in tasks or play
 - does not seem to listen when spoken to directly
 - does not follow instructions or finish tasks
 - difficulty organizing tasks and activities
 - avoids tasks engaging sustained mental effort
 - loses things
 - easily distracted by extraneous stimuli
 - forgetful in daily activities

- **HYPERACTIVITY-IMPULSIVITY** (> 6 for at least 6 months to a degree that is maladaptive and age-inappropriate)

Hyperactivity

- fidgets or squirms in seat
- leaves seat in classroom
- runs about or climbs excessively
- difficulty playing quietly
- is “on the go” or acts as if “driven by a motor”
- talks excessively

Impulsivity

- blurts out answers before questions are completed
- difficulty awaiting turn
- interrupts or intrudes on others’ conversations or games

- Symptoms present before age 7 years
- Symptoms present in 2 or more settings (home/school)
- Diagnosis by exclusion of following:
 - pervasive developmental disorder
 - sensory deficits
 - allergies
 - psychiatric conditions that "mimic" ADHD
 e.g., depression
- Subtypes -
 - Combined-type - both inattention and hyperactivity-impulsivity
 - Inattention-type - inattention only
 - Hyperactive-impulsive - hyperactivity-impulsivity only

Long-term consequences

If untreated -> secondary problems:

- depression
- anxiety
- substance abuse
- academic failure
- work problems
- family problems
- emotional distress

Multimodal Treatment Study of Children with Attention Deficit Hyperactivity Disorder (MTA)

579 children – 14 month study

(1) medication management alone;

(2) behavioral treatment alone;

(3) a combination of both; or

(4) routine community care

MTA Study

(1) medication management alone;
monthly 30 min physician - titration - child/parent

(2) behavioral treatment alone;
35 visits; 8-week summer camp

(3) a combination of both; or

(4) routine community care
1-2 times/year

MTA Study

Best Outcomes

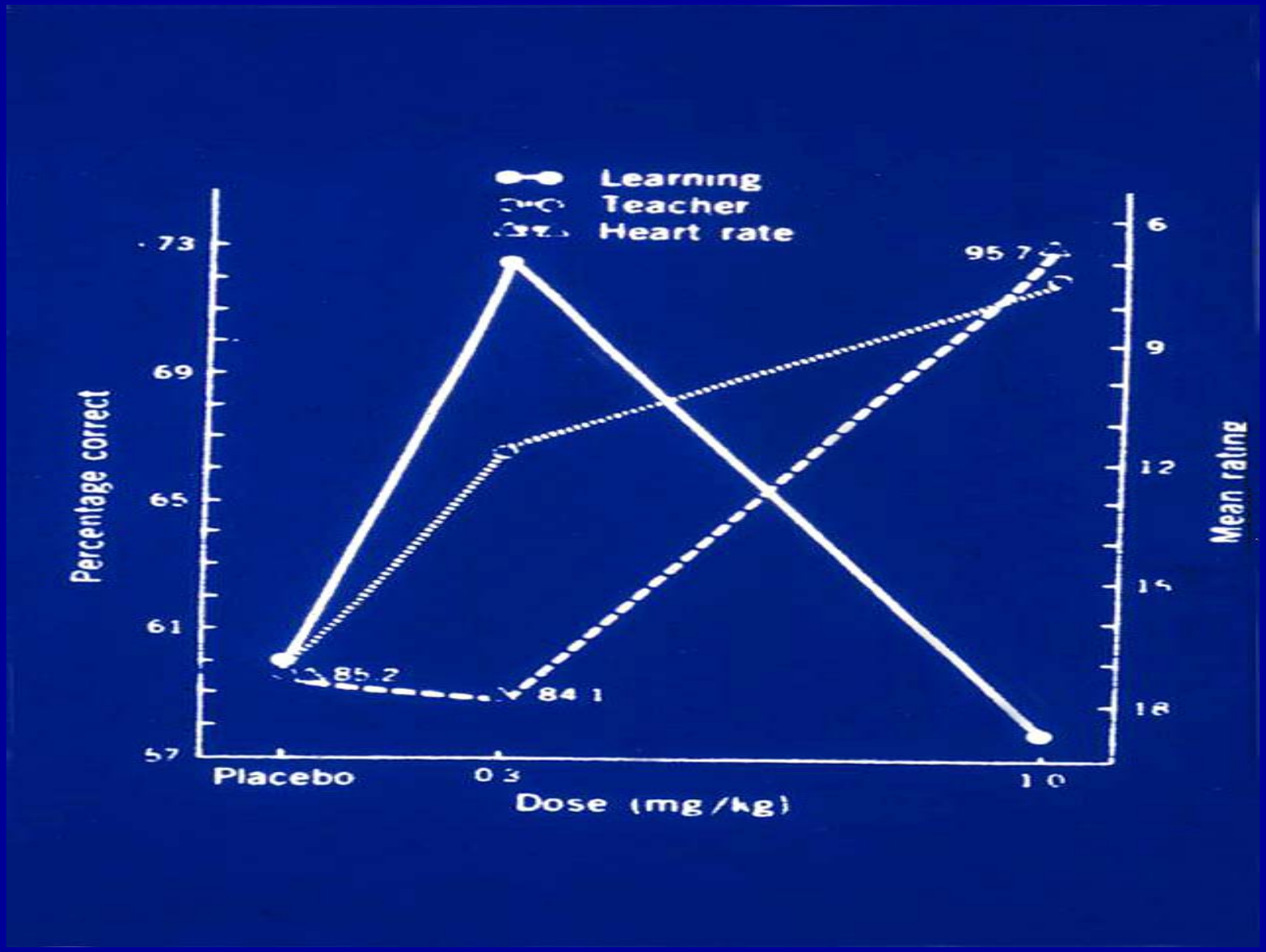
medication management alone or a combination of both

some gains for combined on anxiety, academic performance, oppositionality, parent-child relations, and social skills; lower doses of medications

MTA Study

- 8 years later no difference
- 61.5% stopped taking medication
- no difference between those who did or did not stop taking medications

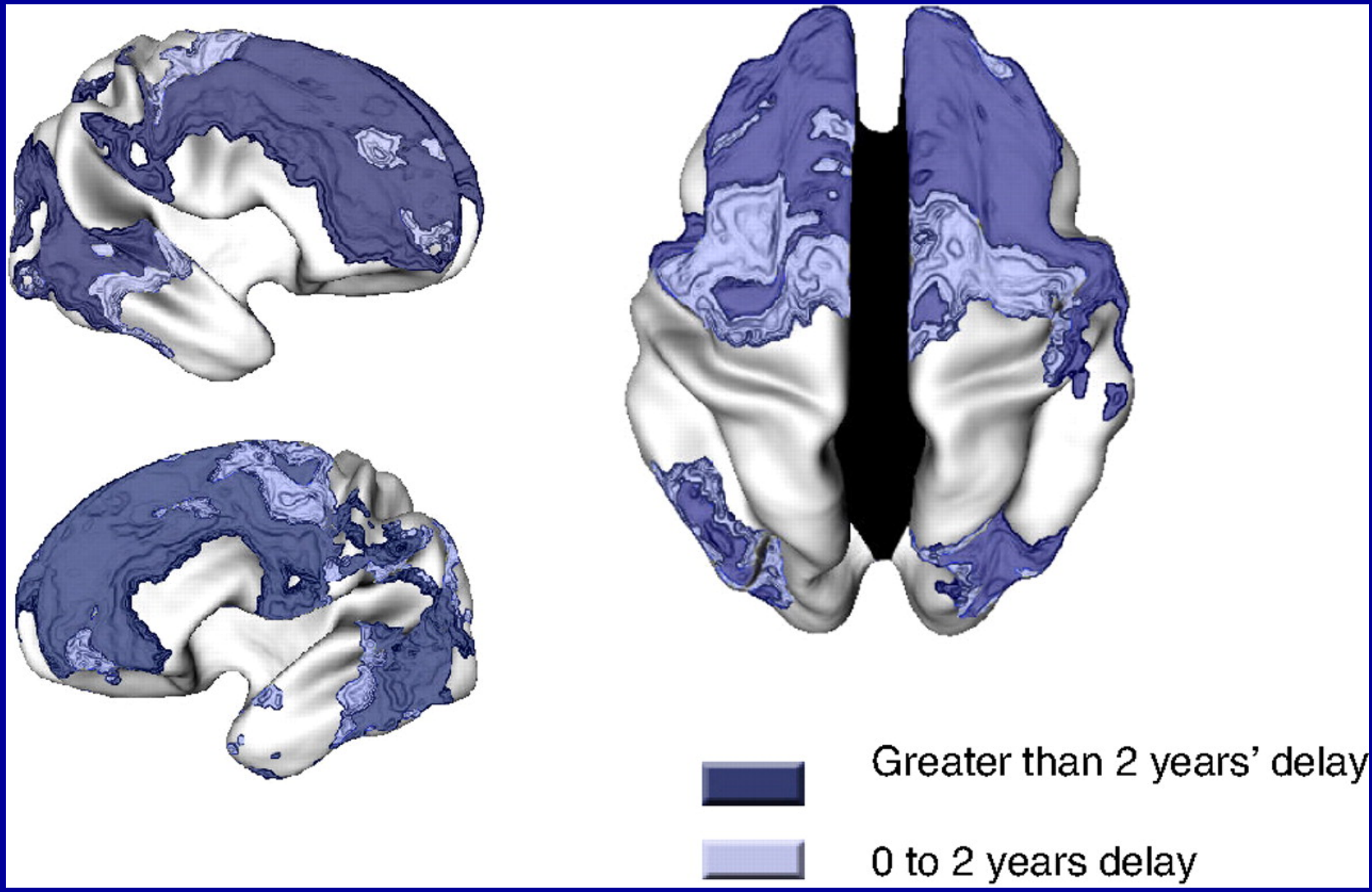
BEST DOSE?



Sprague and Sleator, Science, 1977

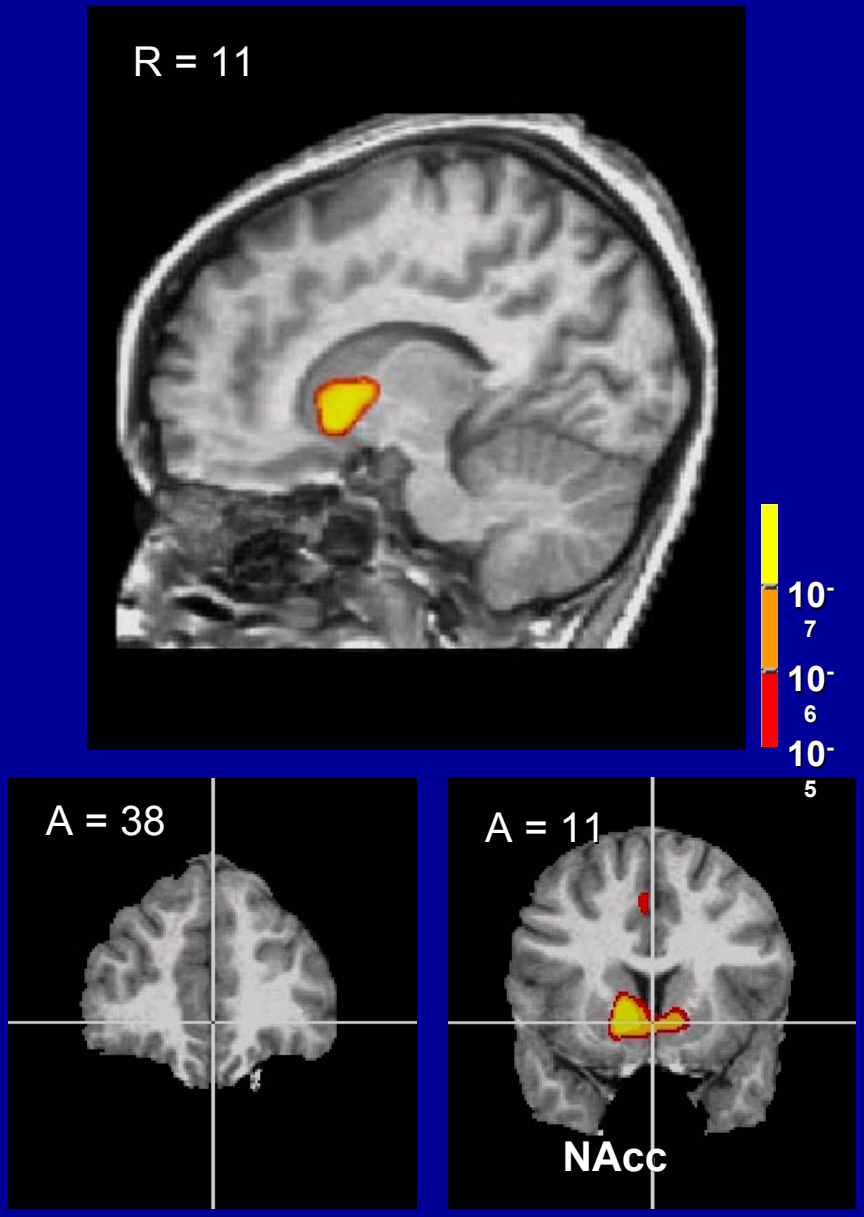
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Regions where the ADHD group had delayed cortical maturation, as indicated by an older age of attaining peak



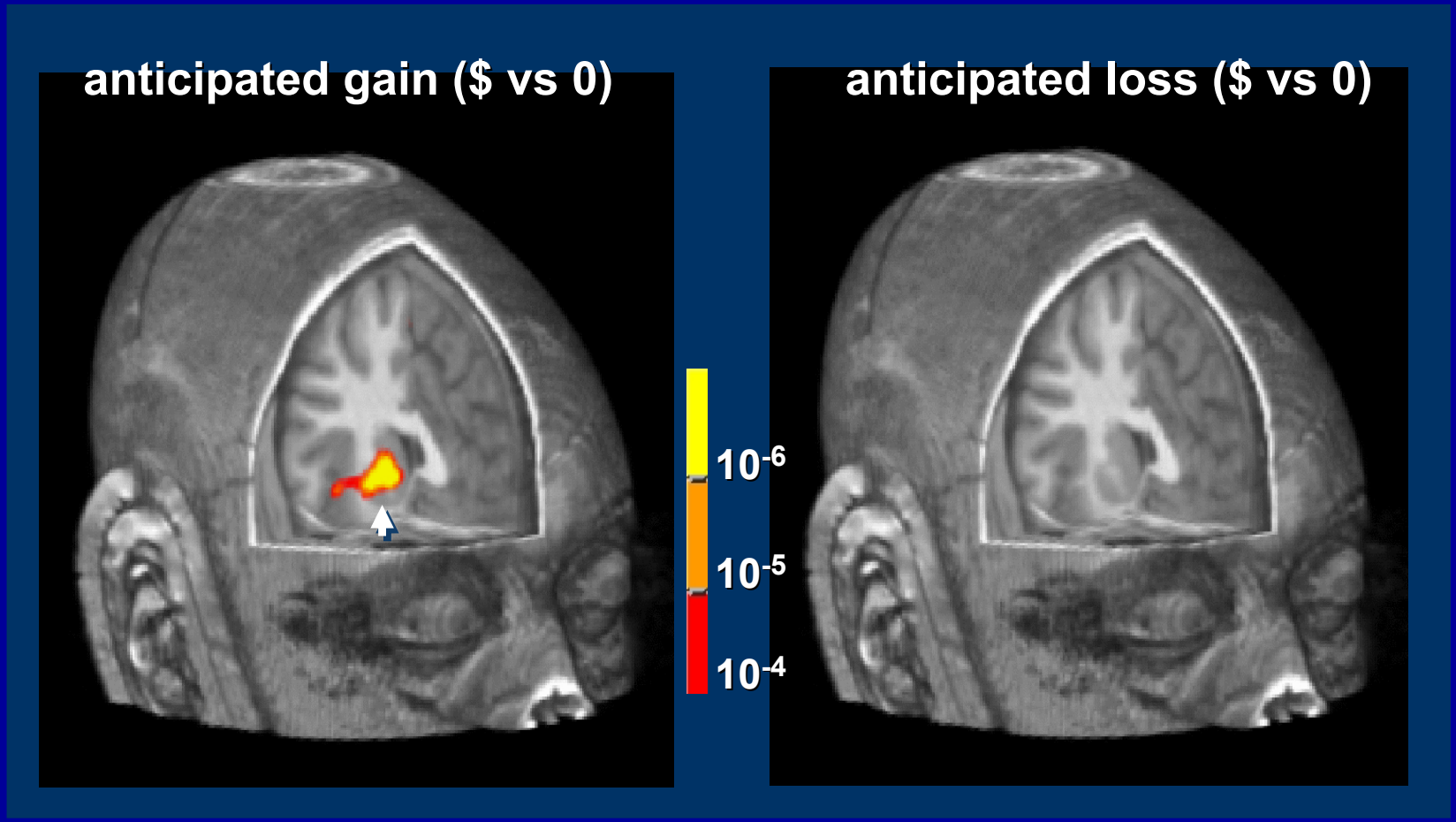
Courtesy of National Academy of Sciences, U.S.A. Used with permission. Source: Shaw, P., et al. "Attention-Deficit/Hyperactivity Disorder is Characterized by a Delay in Cortical Maturation." *PNAS* 104, no. 49 (2007): 19649-54. Copyright ©2007 National Academy of Sciences, U.S.A.

Nucleus Accumbens recruited by anticipation of responding for a reward versus nonreward



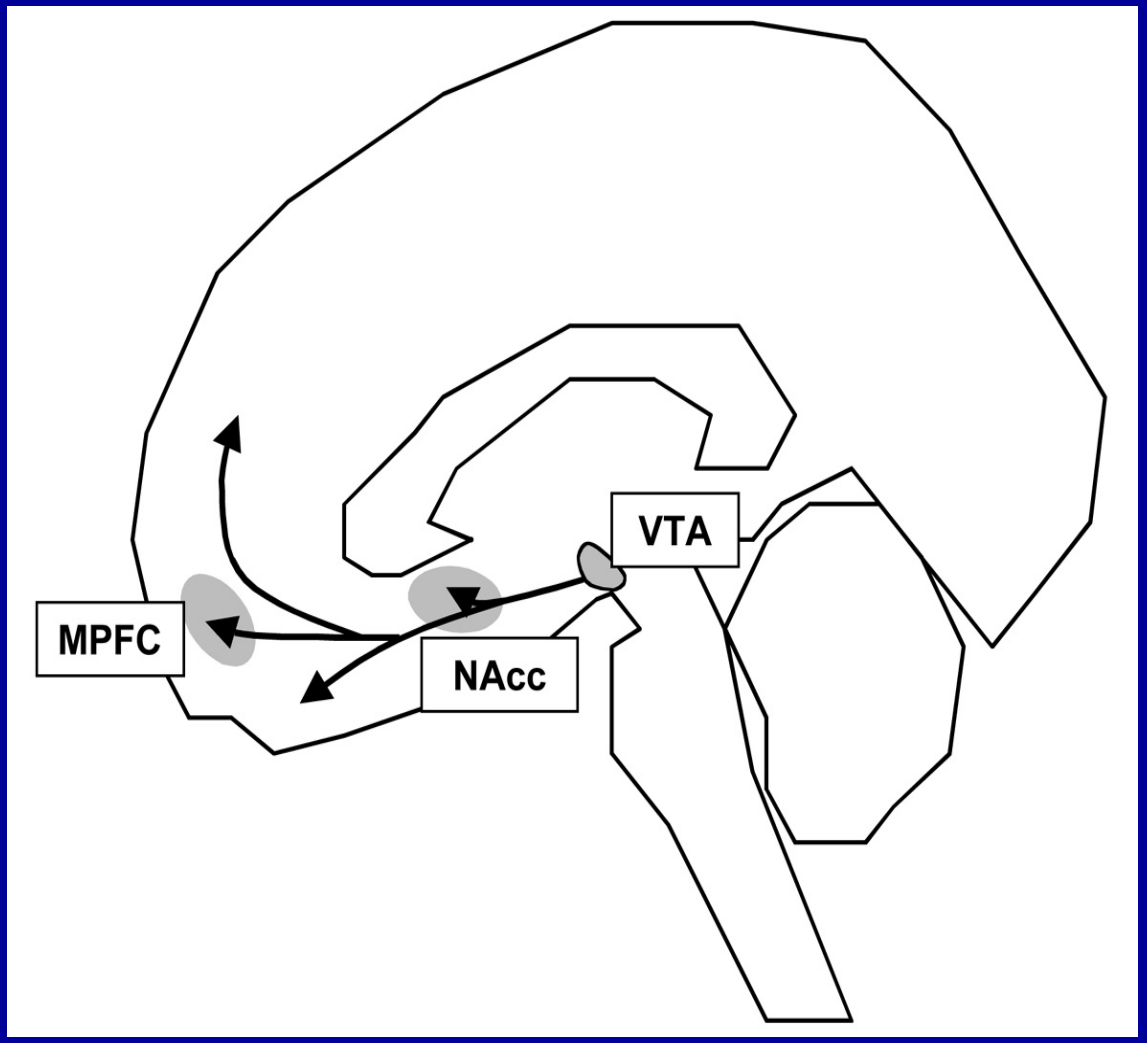
Courtesy of Brian Knutson.
Used with permission

Gain anticipation activates Nucleus Accumbens



Courtesy of Brian Knutson. Used with permission

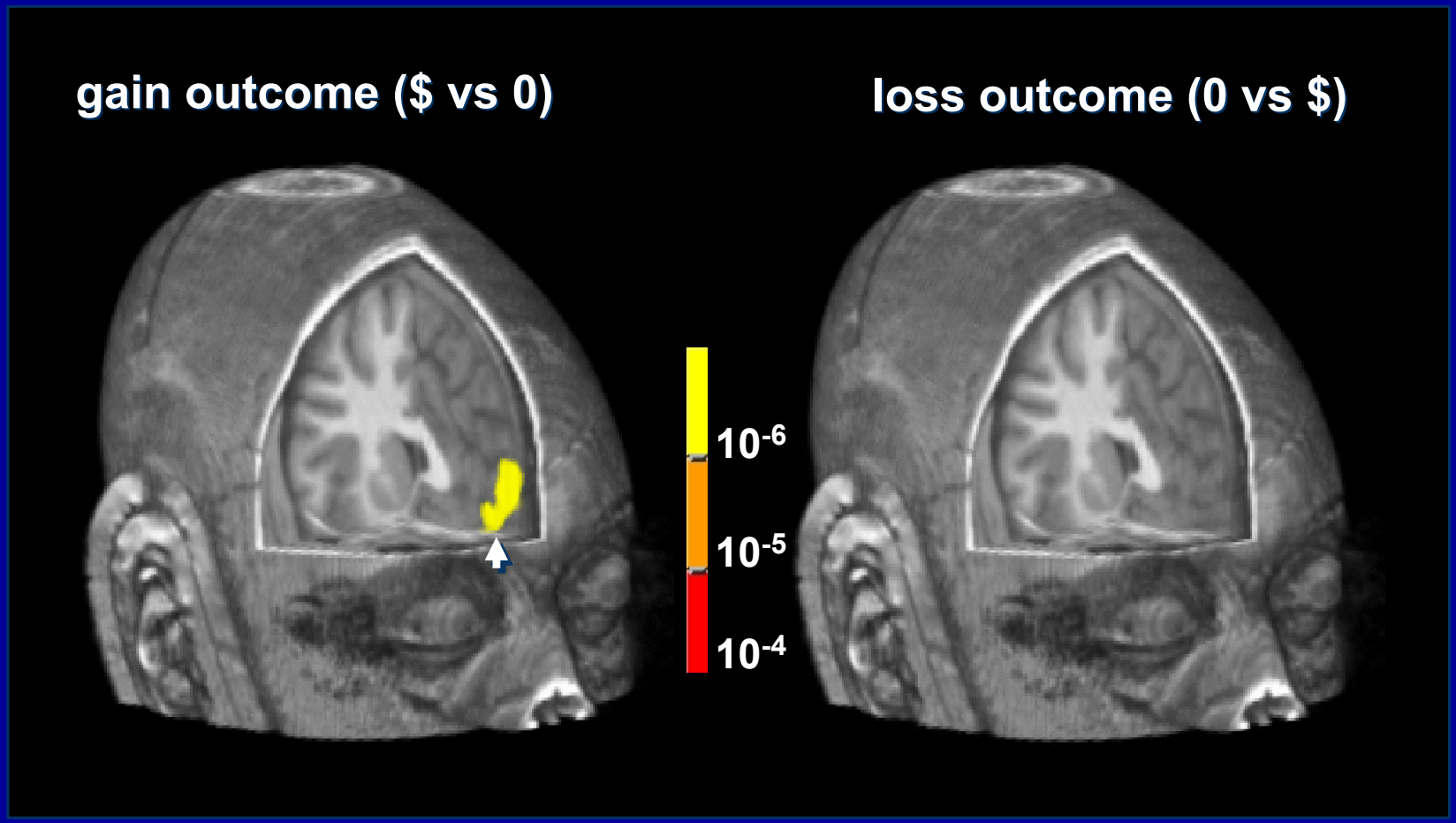
Mesolimbic Dopamine Projections



Knutson, B., and S. E. B Gibbs (2007) *Psychopharmacology*

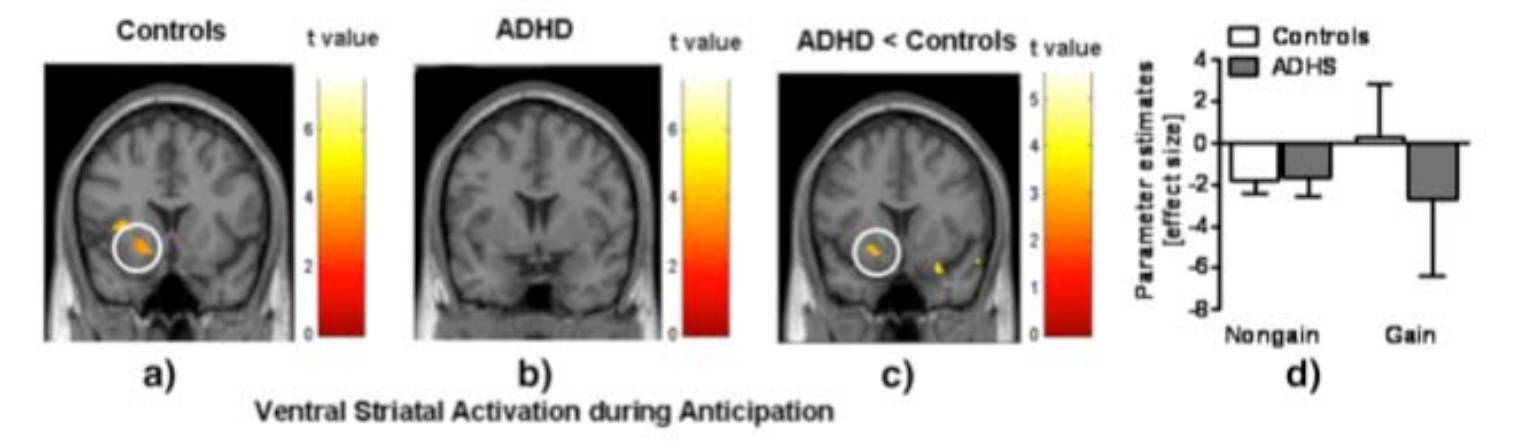
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Gain outcomes activate MPFC

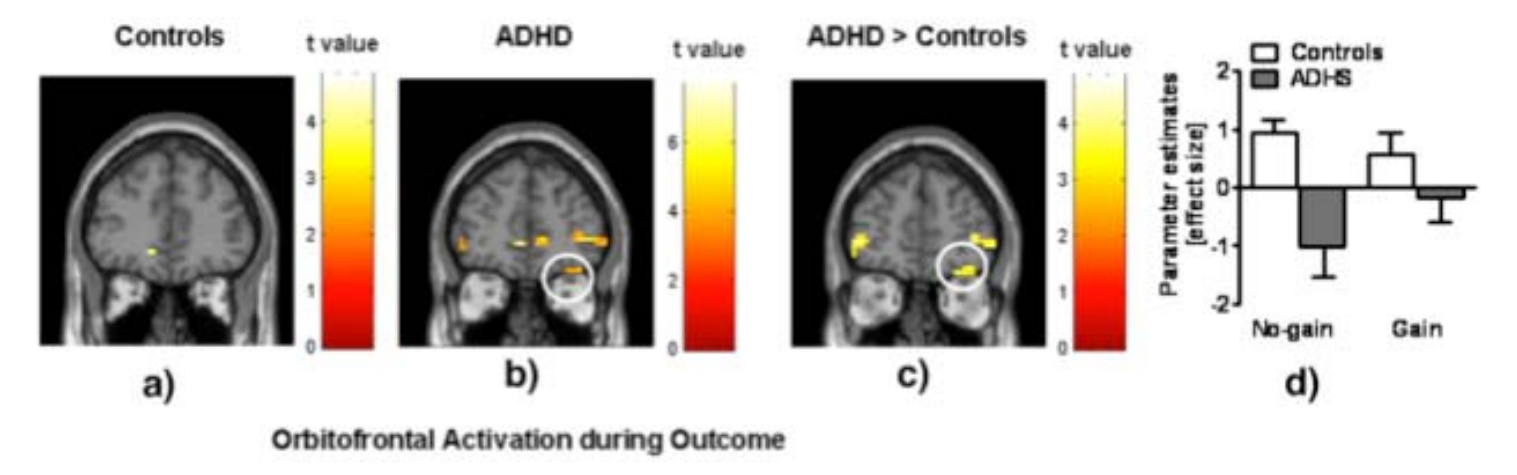


Courtesy of Brian Knutson. Used with permission

LESS RESPONSE TO REWARD *ANTICIPATION* IN ADHD

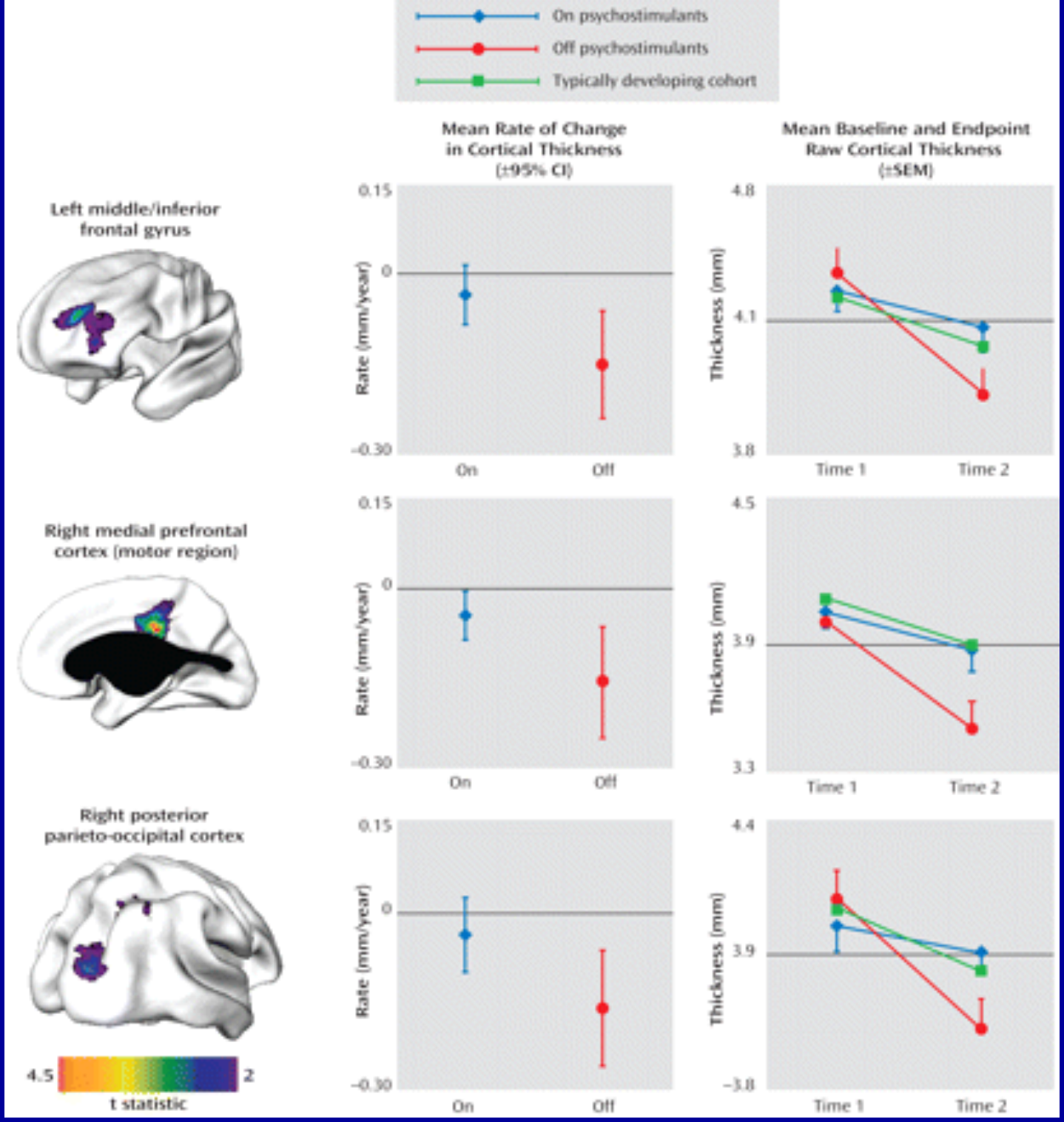


GREATER RESPONSE TO REWARD *OUTCOME* IN ADHD



Source: Ströhle, A., et al. *NeuroImage* 39 (2008): 966-72. Courtesy of Elsevier, Inc., http://www.sciencedirect.com. Used with permission.

Treatment With Psychostimulants Does Not Slow Development Of Cerebral Cortex



Shaw, et.al,
Am J Psychiatry, 2009

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Questions

- Does brain function differ in ADHD and control children?

 Do brain regions involved in inhibitory control function differently in children with ADHD?

- Does Ritalin have different effects on brain function in ADHD and control children?

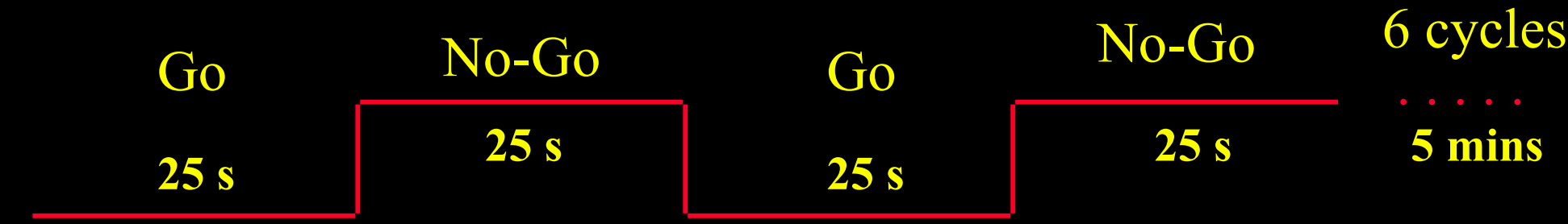
 - Treatment by stimulants (e.g. Ritalin)
 - Brain changes that mediate effectiveness are unknown
 - Effects in control children are unknown

Participants

		Age (yrs)	WISC IQ		
			Verb	Perf	Full
ADHD n = 10	Mean	10.5	121	117	120
Control n = 6	Mean	9.3	128	118	124

See Vaidya, C. J., J. D. E. Gabrieli, et al. "Selective Effects of Methylphenidate in Attention Deficit Hyperactivity Disorder: A Functional Magnetic Resonance Study" *PNAS* 95 (1998): 14494-9.

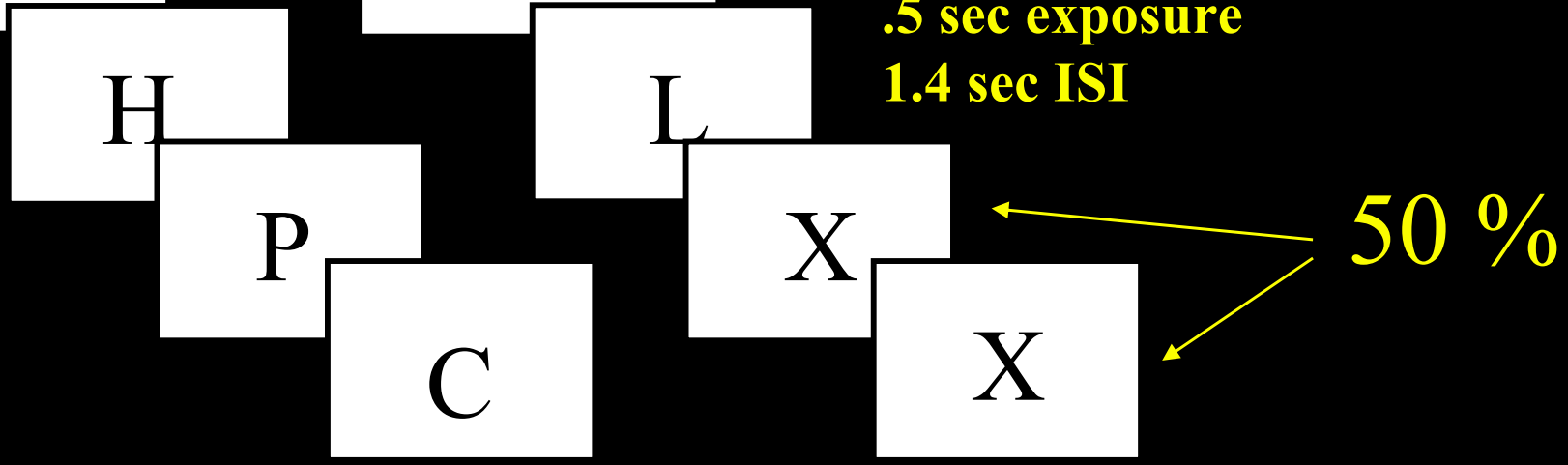
Go-No-Go Task



"Respond to all letters"

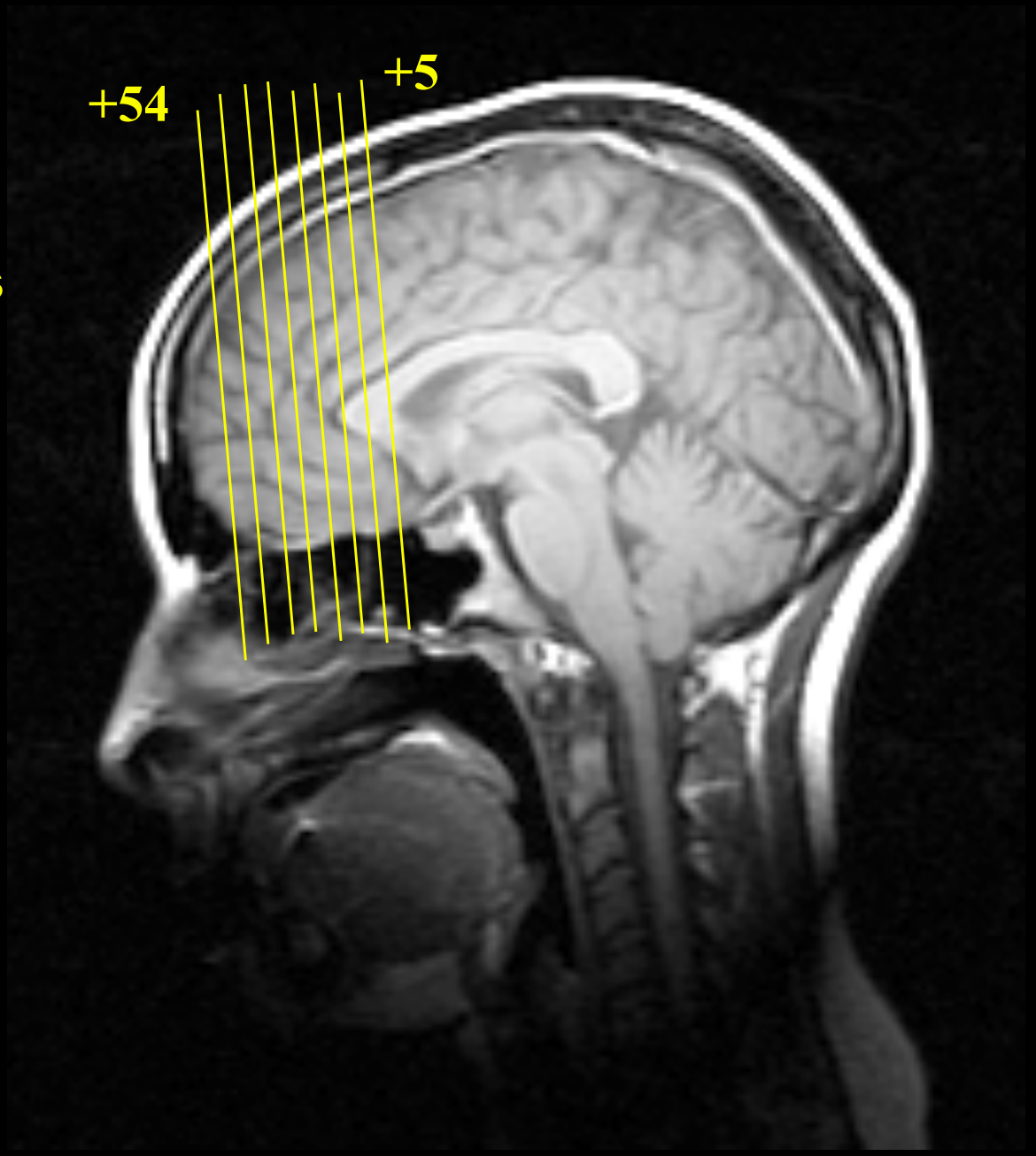
"Do not respond to X"

.5 sec exposure
1.4 sec ISI

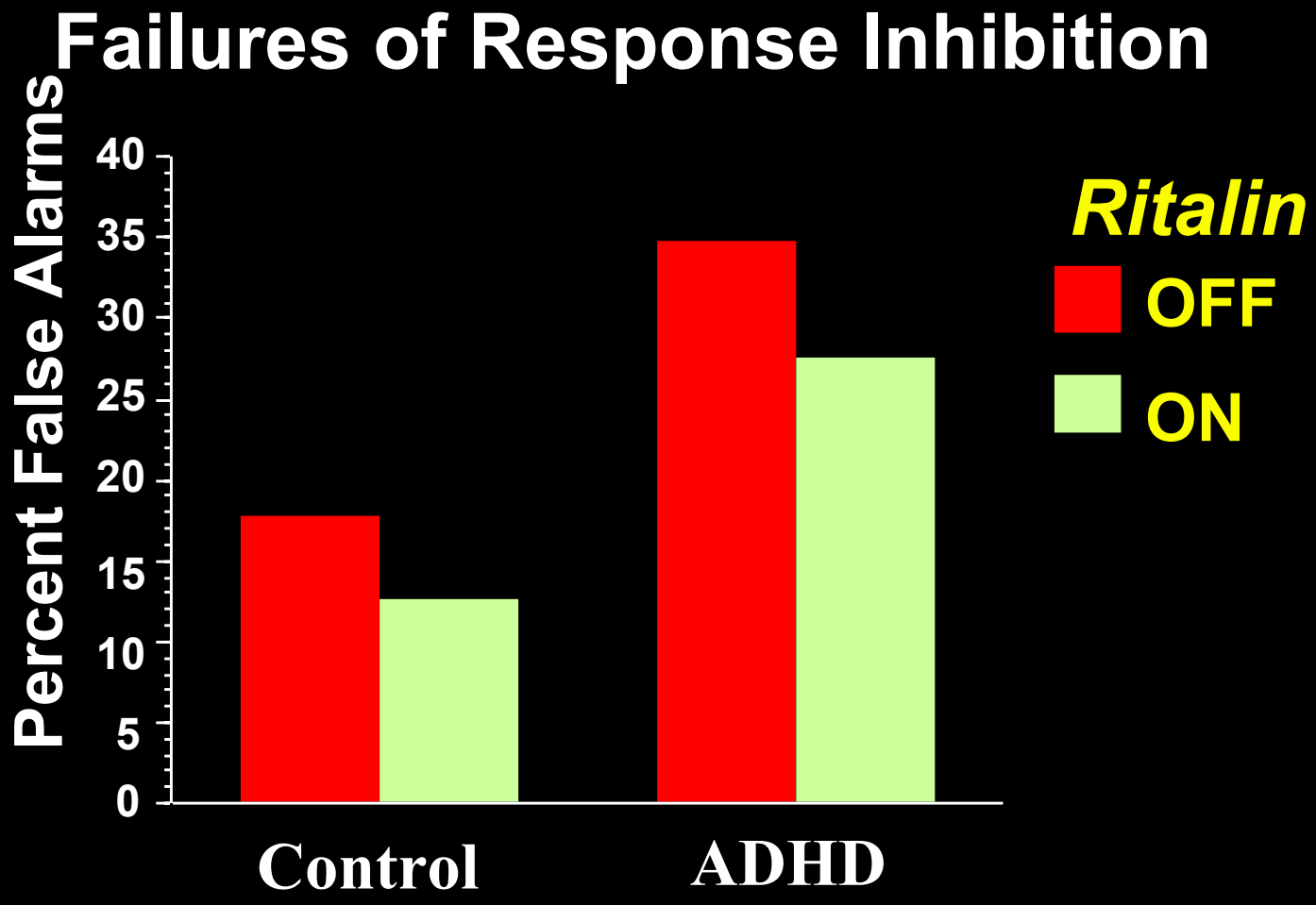


Functional Scanning Parameters

- 1.5 T GE
- Gradient Echo Spiral Pulse Sequence
- TR/slice = 90 ms, TE = 40 ms
- Flip angle = 65
- 4 interleaves
- FOV = 36 cm
- 8 coronal slices: 6 mm thick
 1 mm inter-slice space
- Continuous acquisition for 300 s
- In-plane resolution: 2.35 mm
- Image acquisition = 2.88 sec
- Bite-bar to minimize motion
- Time-series data analysis: Friston et al., 1994

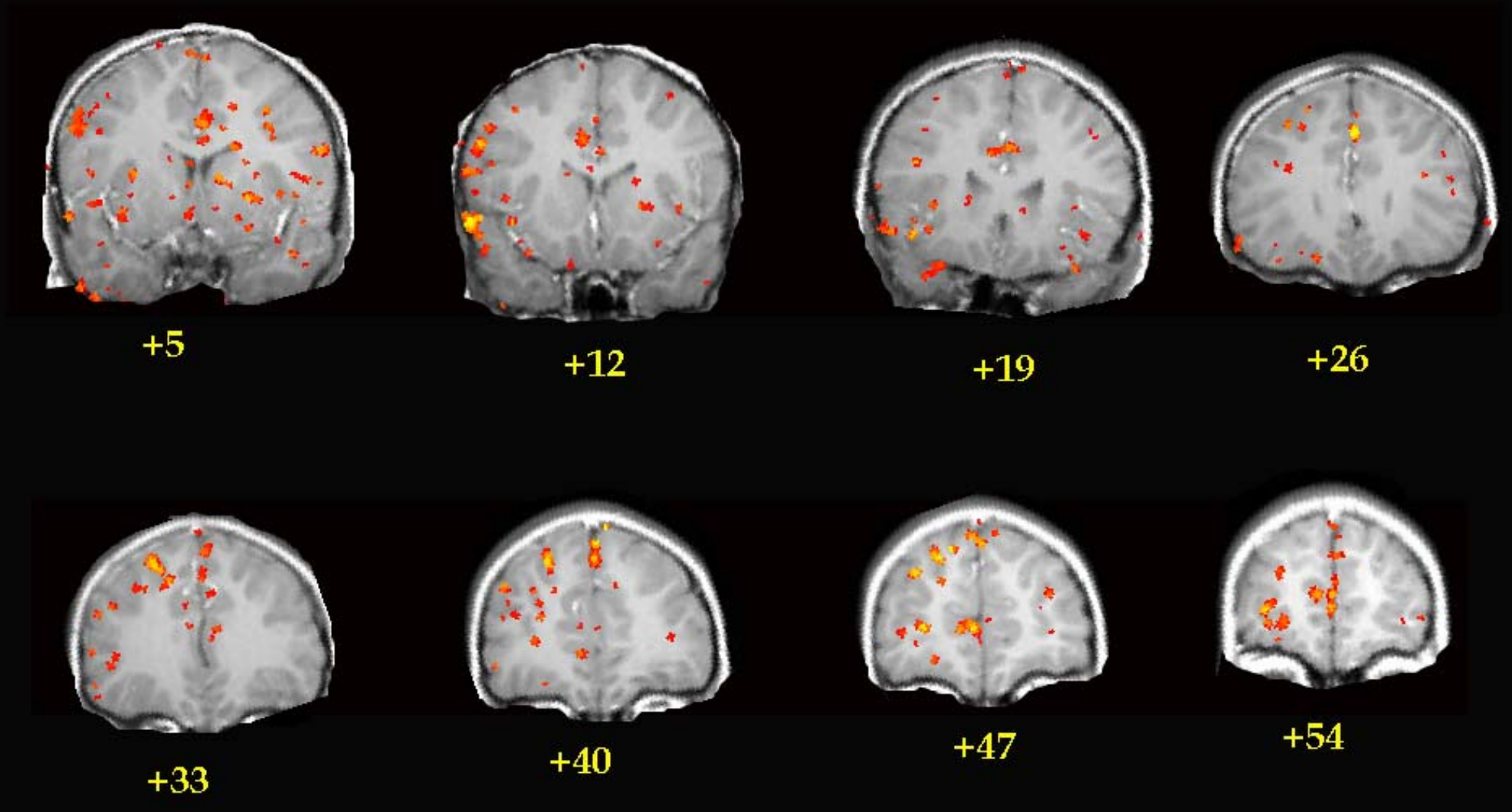


Effect of Ritalin on Performance

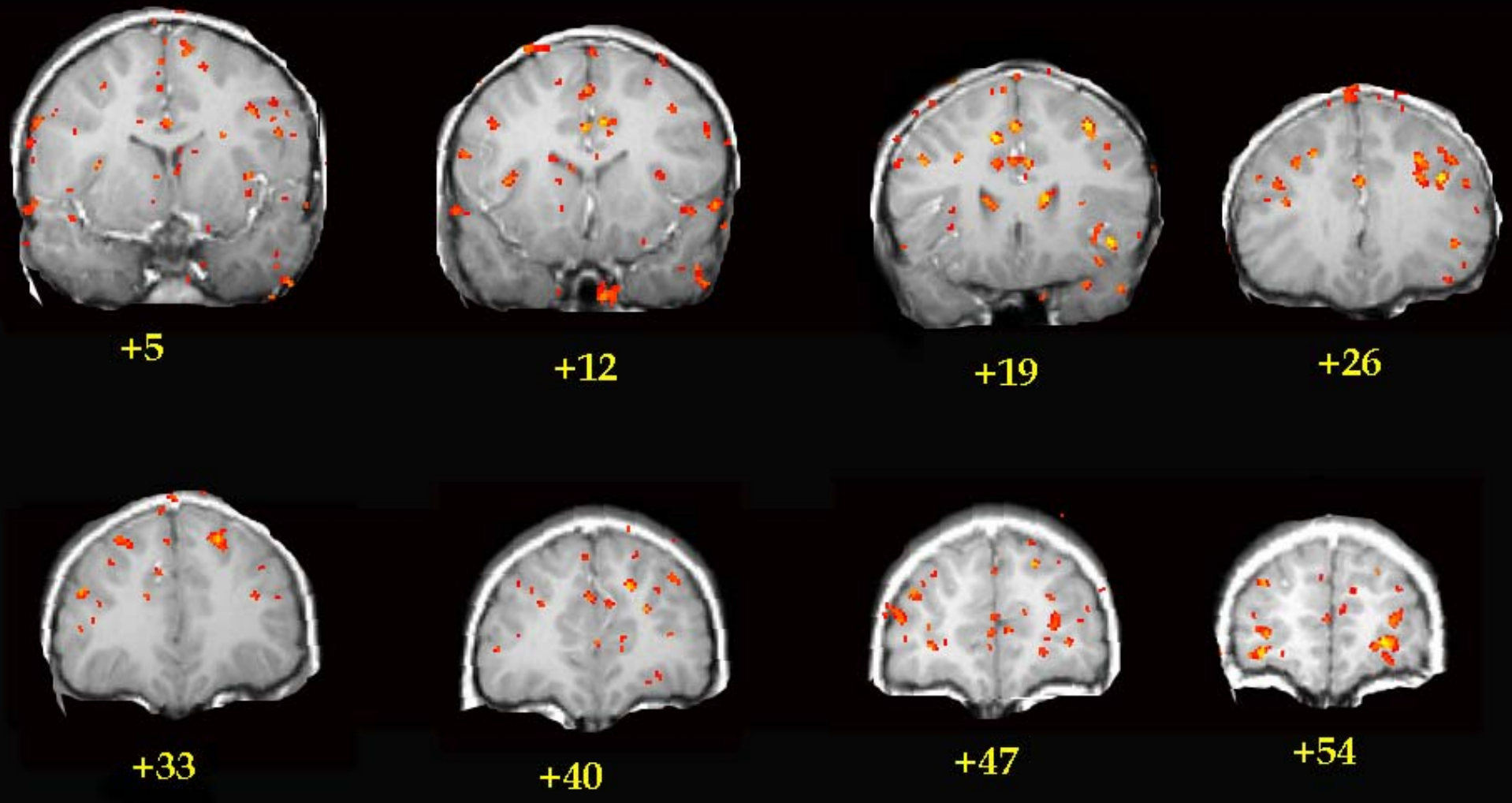


Ritalin improved performance in both groups

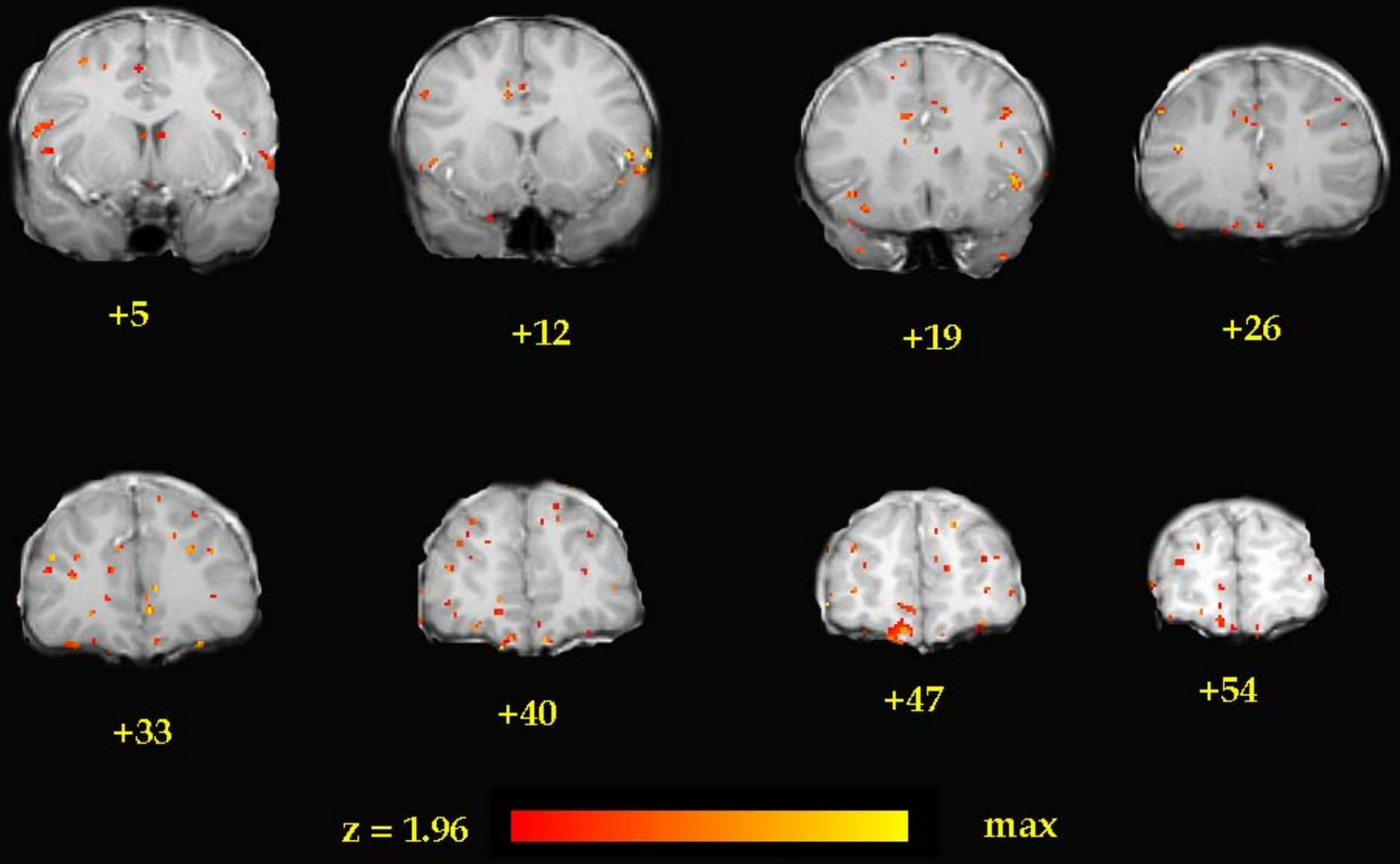
Activation during No-Go blocks in controls off-Ritalin



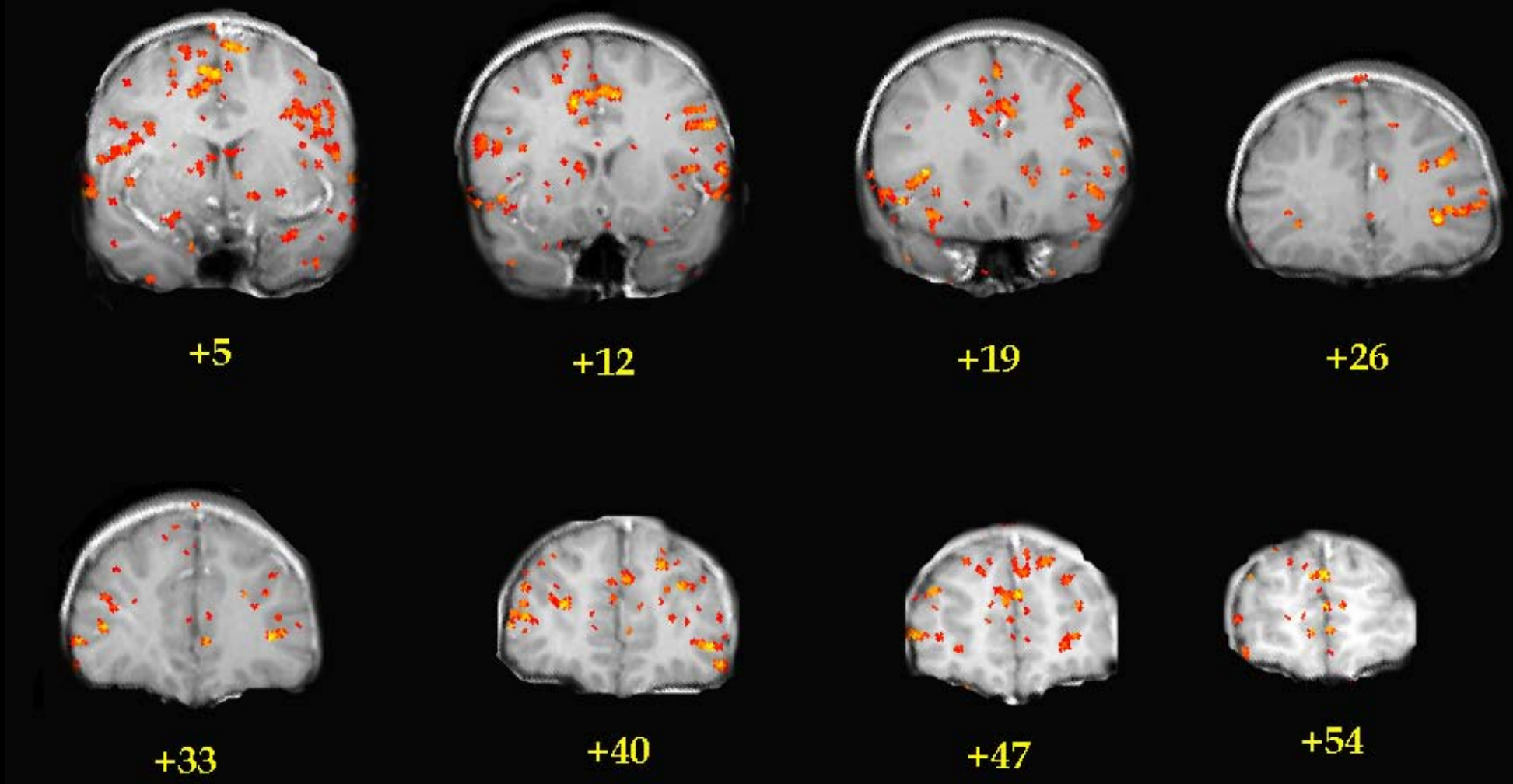
Activation during No-Go blocks in controls on-Ritalin



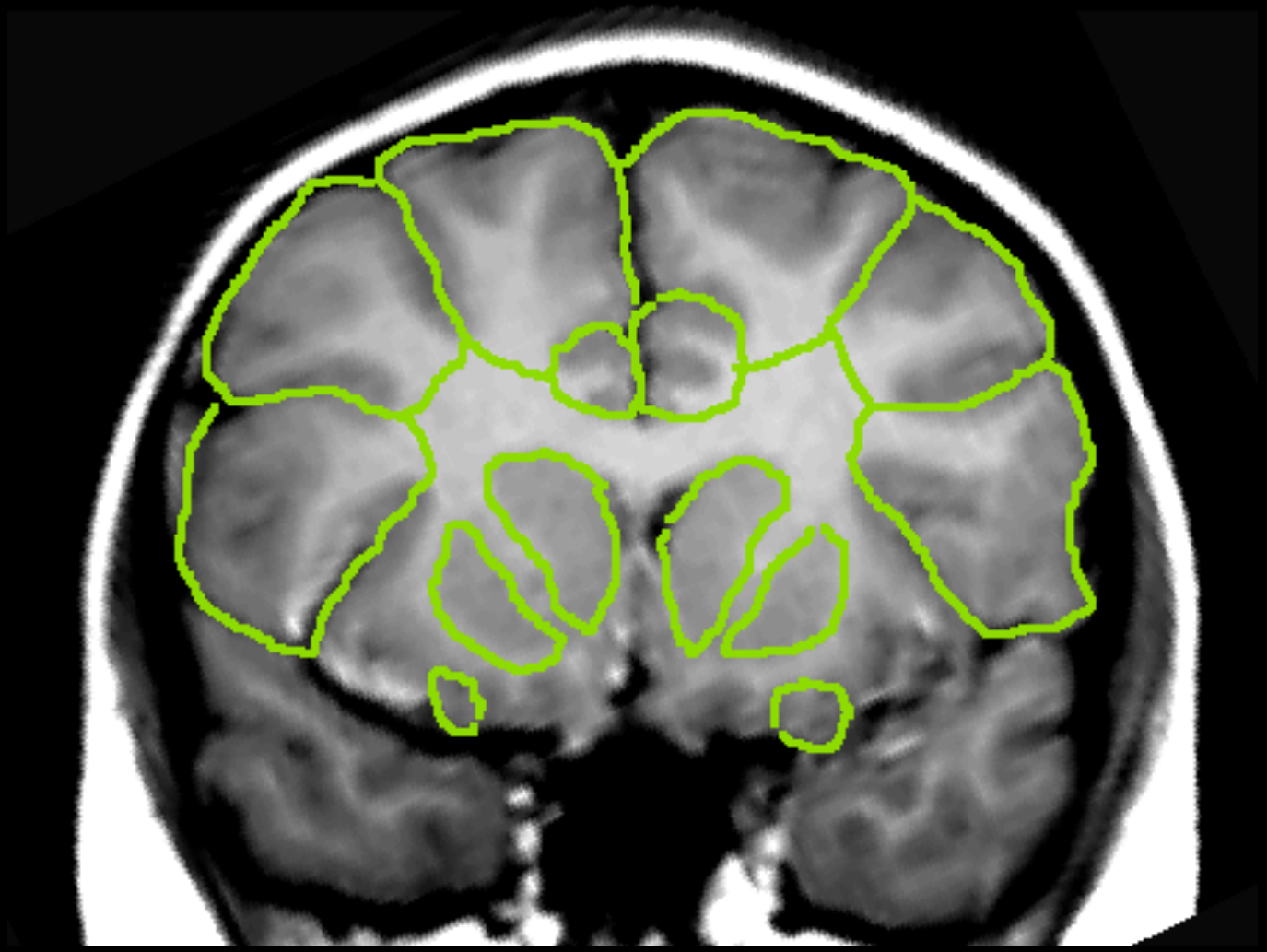
Activation during No-Go blocks in ADHD off-Ritalin



Activation during No-Go blocks in ADHD on-Ritalin



Regions of Interest



slice +12

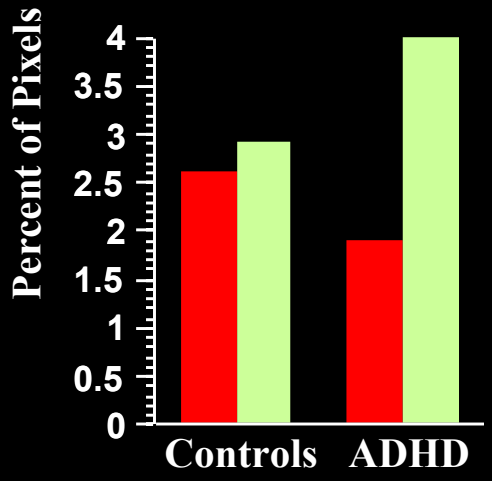
Frontal Lobe Regions

Ritalin

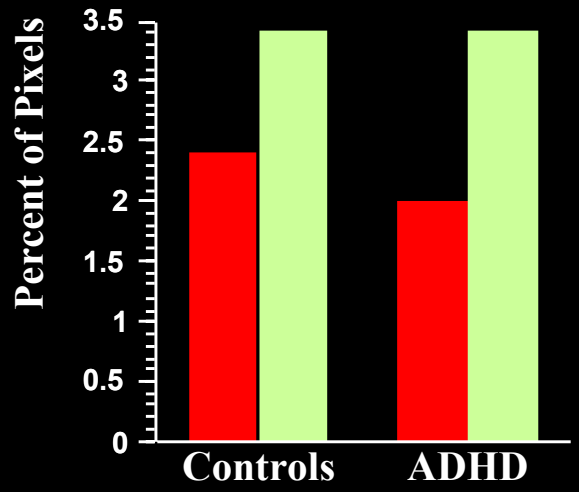
OFF

ON

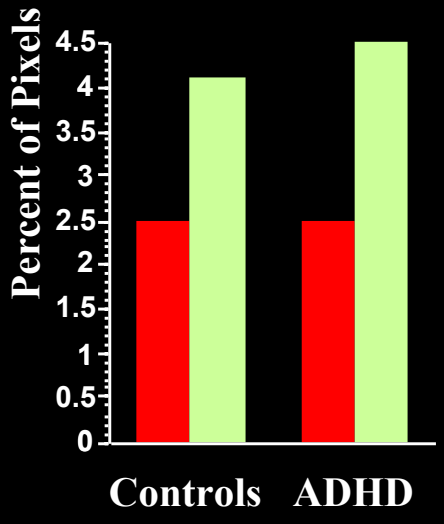
Superior Frontal Gyrus



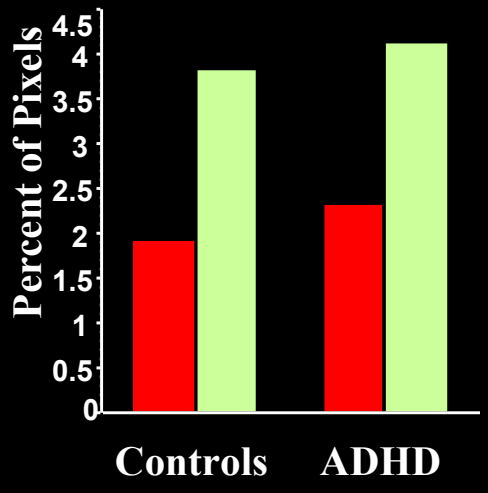
Middle Frontal Gyrus



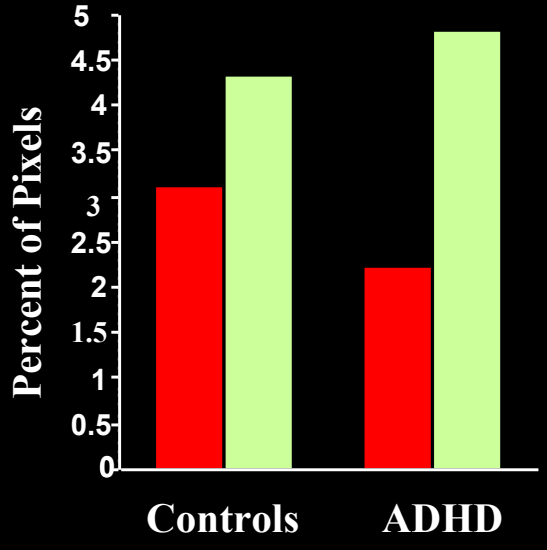
Inferior Frontal Gyrus



Orbital Frontal Gyrus



Ant. Cingulate Gyrus



Brain structures implicated in ADHD

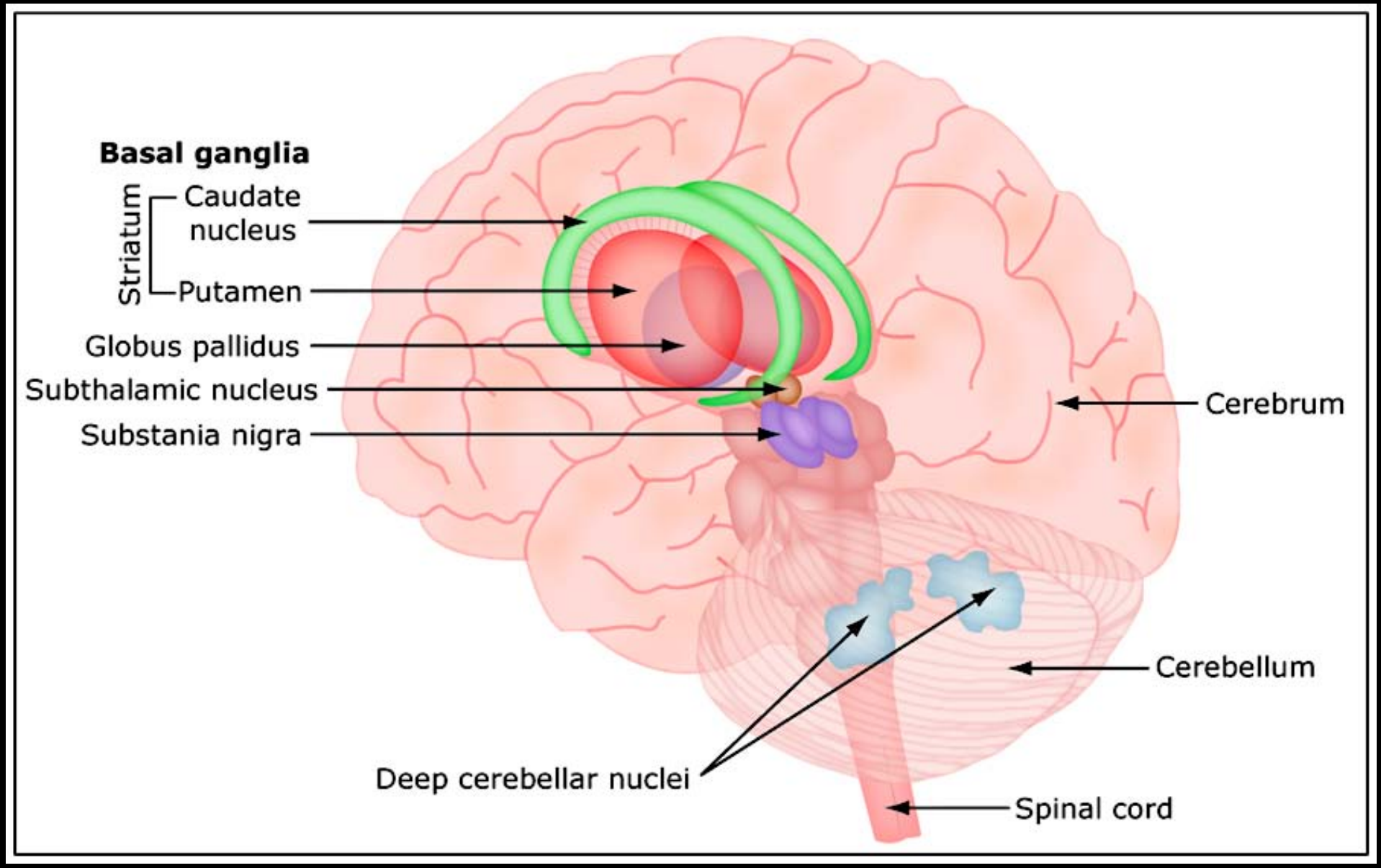
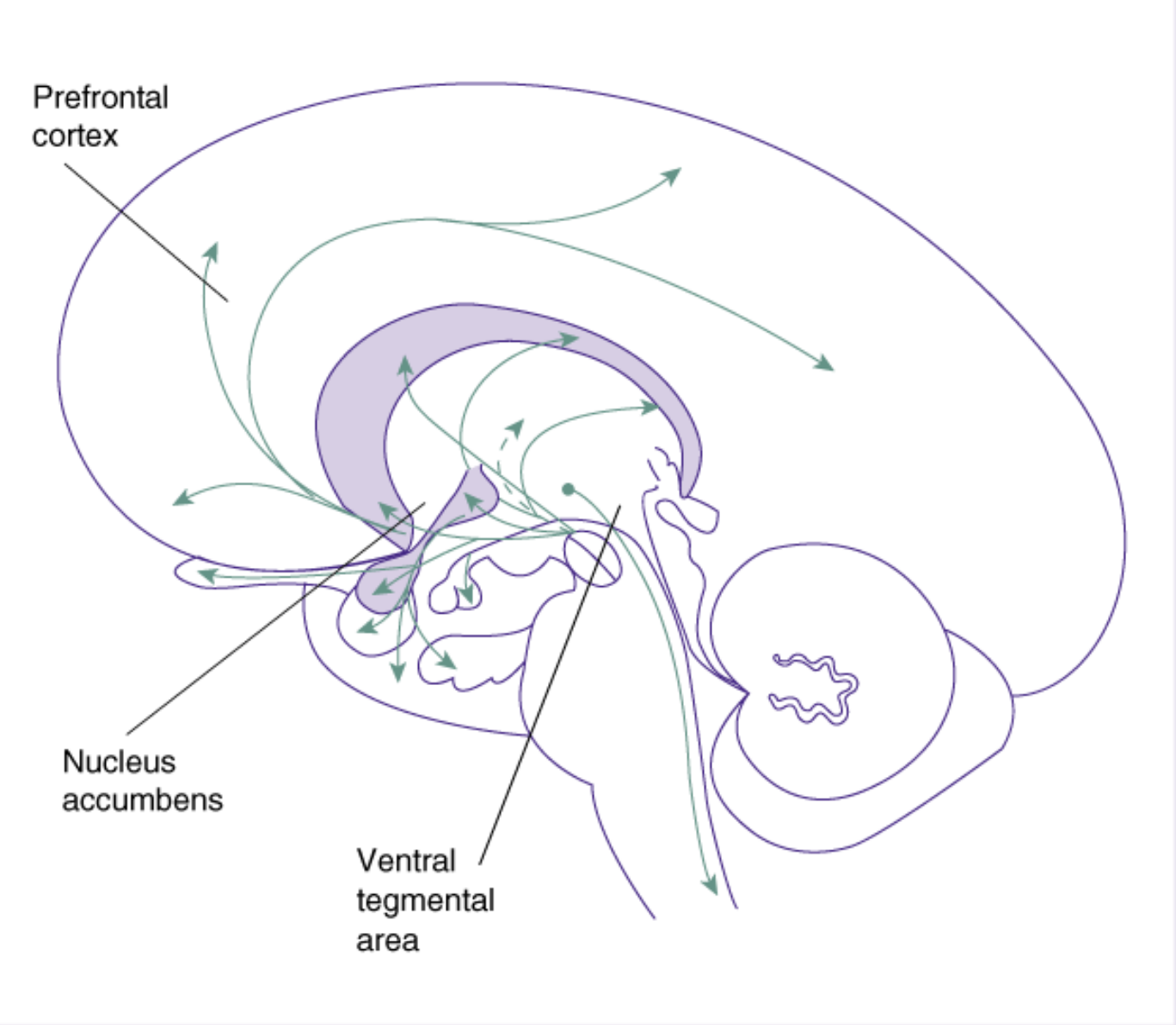
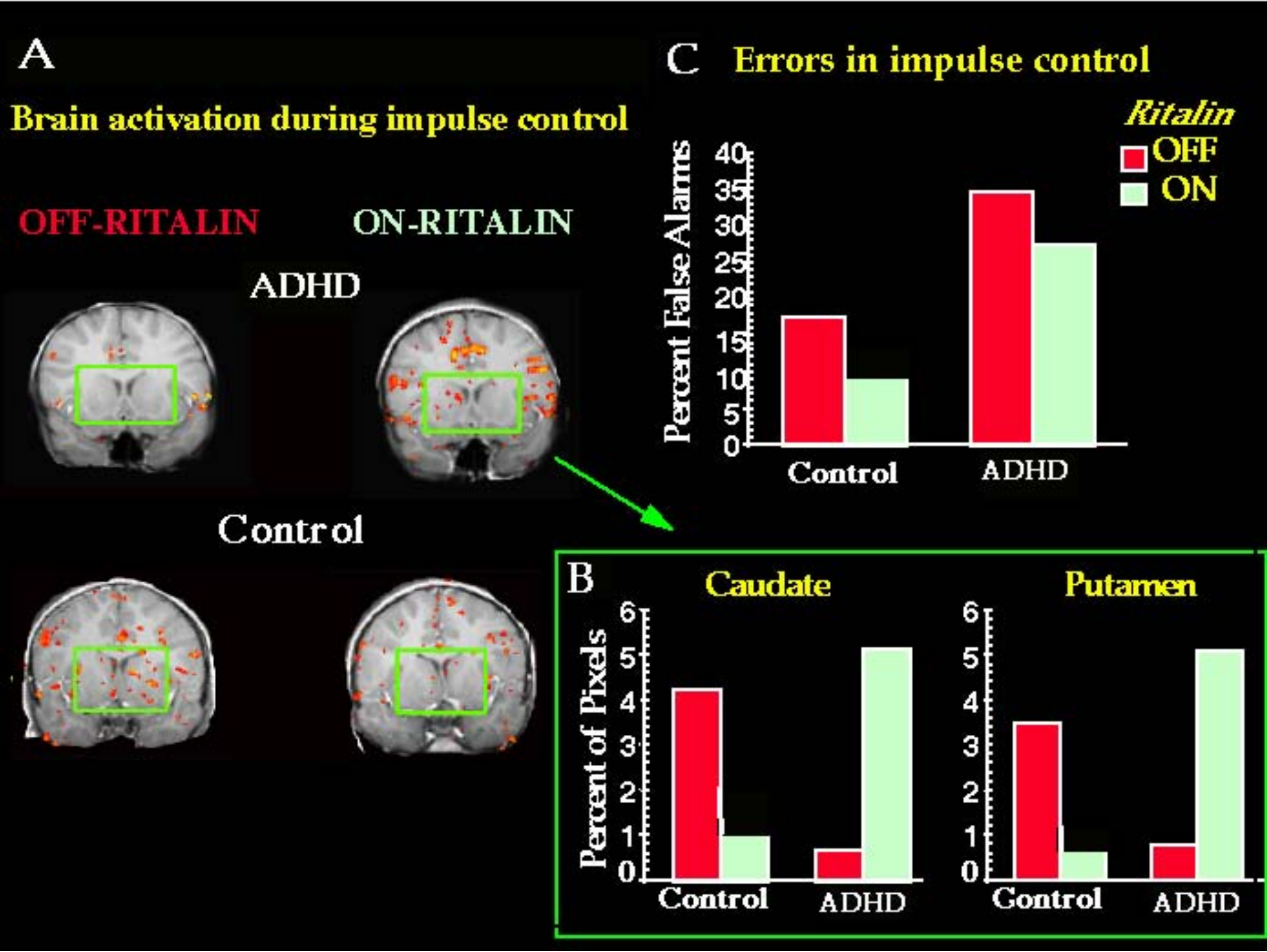


Image by MIT OpenCourseWare.

Dopaminergic pathways



Source: NIH


A
Brain activation during impulse control
OFF-RITALIN
ON-RITALIN
ADHD
Control
C
Errors in impulse control
Ritalin
OFF
ON
Percent False Alarms
0
5
10
15
20
25
30
35
40
Control
ADHD
B
Caudate
Putamen
Percent of Pixels
0
1
2
3
4
5
6
Control
ADHD
Control
ADHD

FROM VARIATION TO DISEASE

to what extent is variation "pathologized"?
how should people pursue happiness?

- height and human growth hormone?
 (men, 5'9"; women 5'4")
- sadness to depression?
- shyness to social anxiety disorder?
- failure to follow directions to ADHD?

- use of stimulants to enhance performance – 7% of university students? 20% of scientists in on-line poll

- ethics – what is the right thing? also fairness, freedom, long-term risks?

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9.00SC Introduction to Psychology
Fall 2011

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SOCIAL PSYCHOLOGY I

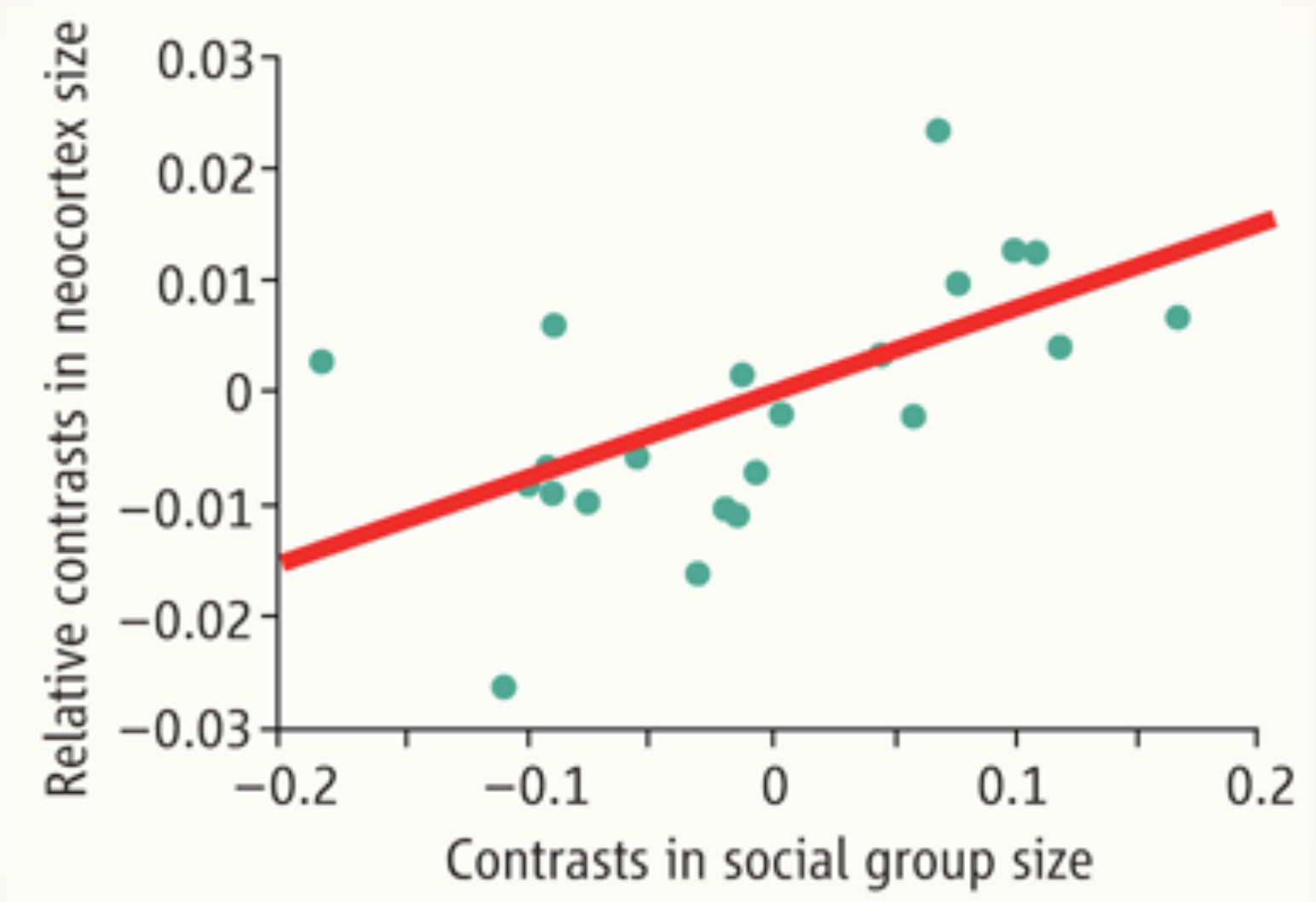
John Gabrieli

9.00

What is social psychology?

The scientific study of the way in which our thoughts, feelings, and behaviors are influenced by the real or imagined presence of other people.

EXISTING PRIMATE SPECIES



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SOCIAL PSYCHOLOGY: *THE POWER OF THE SITUATION*

- **Attribution - dispositional/situational**
- **Fundamental Attribution Error**
- **Conformity**
- **Compliance**
- **Obedience**
- **Bystanders and Helping**

Why Did That Person Do That?

Attributions



Image courtesy of Barack Obama on Flickr.

Why is she smiling at me?

Causal attribution **refers to inferring a cause for a person's behavior (one's own or that of another person).**

Character or Situation?

Jeremiah helped the elderly man.

Sven had a hard time solving the puzzle.

Tamae gave money to the boy.

Images on this slide removed due to copyright restrictions.

Why Did That Person Do That?

- ***Who she or he is***

 character, personality, traits, disposition

- ***Situation she or he is in***

Character or Situation?

Jeremiah helped the elderly man.

Sven had a hard time solving the puzzle.

Tamae gave money to the boy.

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Attributions



Late for an Appointment

You (other)

Late for an Appointment

You (other) - *Dispositional*

inconsiderate

disorganized

unmotivated

Late for an Appointment

You (other) - *Dispositional*

inconsiderate

disorganized

unmotivated

Me

Late for an Appointment

You (other) - *Dispositional*

inconsiderate

disorganized

unmotivated

Me - *Situational*

busy

traffic

Fundamental attribution error

Lee Ross

A tendency to believe that a behavior is due to a person's disposition rather than the situation in which the person finds him/herself.

"Quiz-Show Study"
Ross, Amabile, & Steinmetz (1977)

• students run in pairs; drew cards to select "quiz master" or "contestant"

• Quiz master came up with questions which the contestant had to answer.

• For example: Who were the two inventors of calculus? [Answer: Newton and Leibniz]

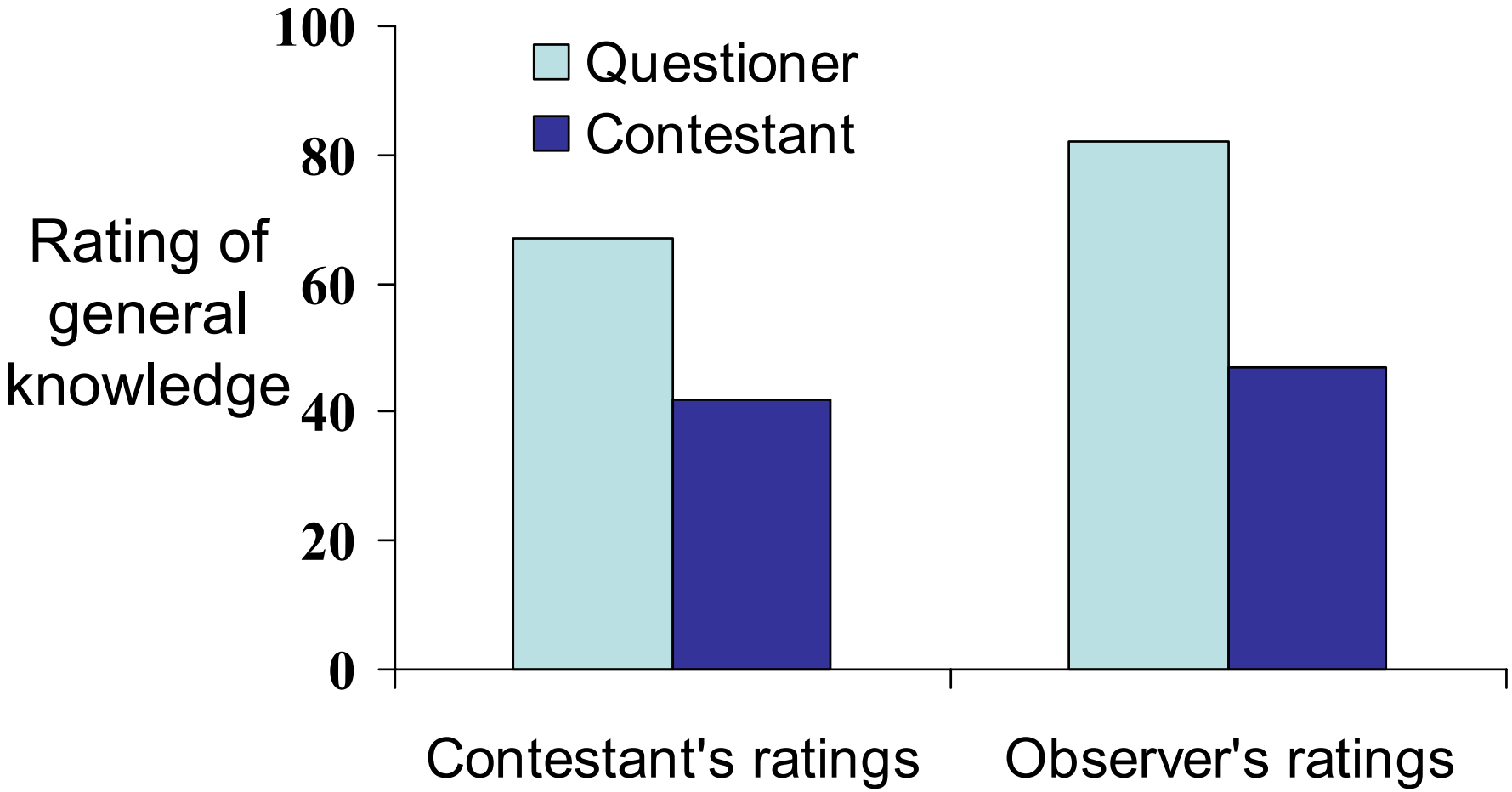
• This setup gave a huge advantage to the for quiz masters! 40% correct for contestents

Student Audience

How knowledgeable is this person in general compared to the average Stanford population?

- 0: Much less knowledgeable
- 50: About average
- 100: Much more knowledgeable

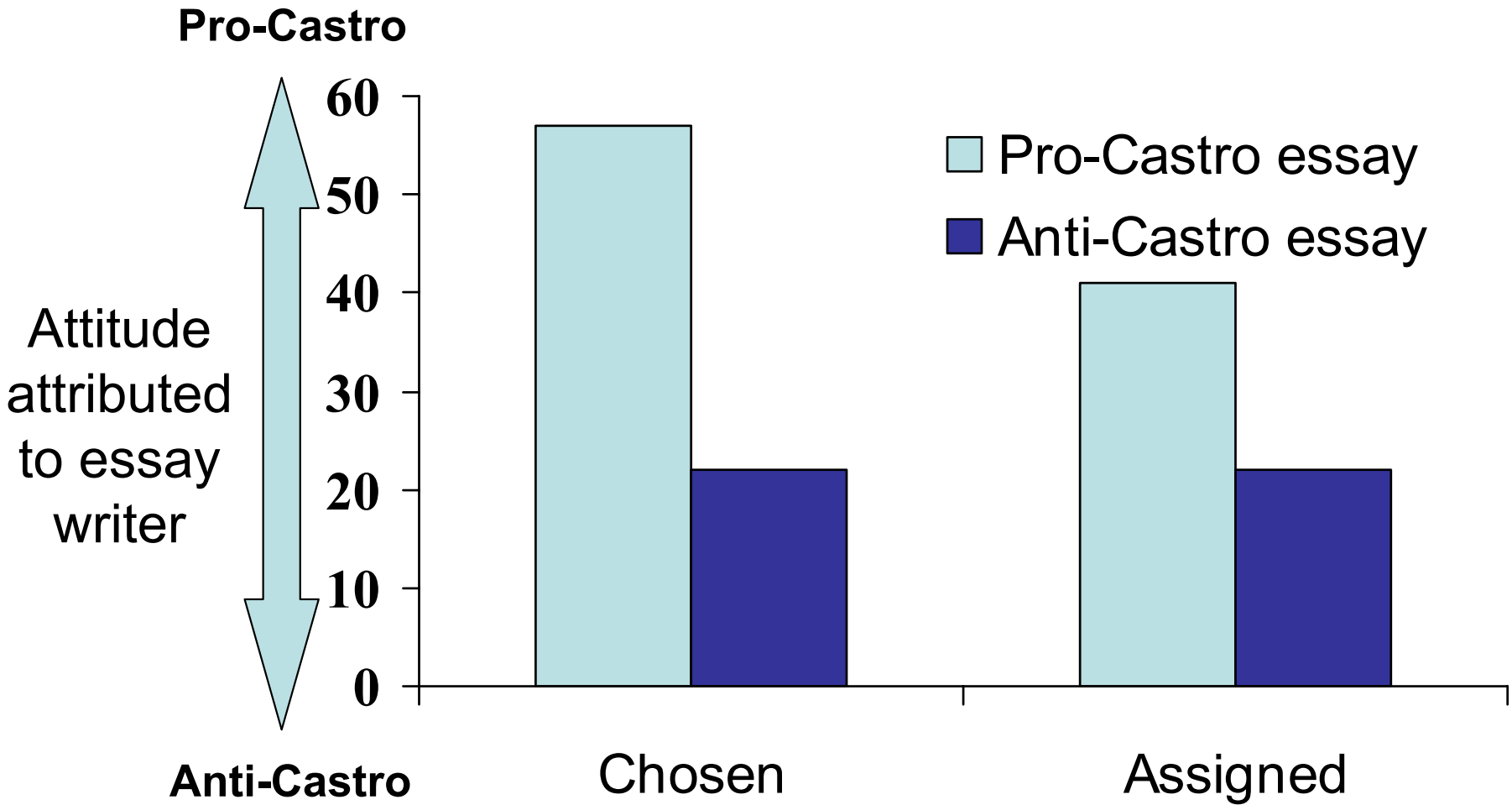
“Quiz Show Study”



"Castro Study"
Jones & Harris (1967)

- Participants read Pro-Castro or Anti-Castro essays.
- The opinions expressed in the essays were presented as chosen vs. assigned 50/50.
- Participants' ratings of how pro-Castro they thought the essayist was.

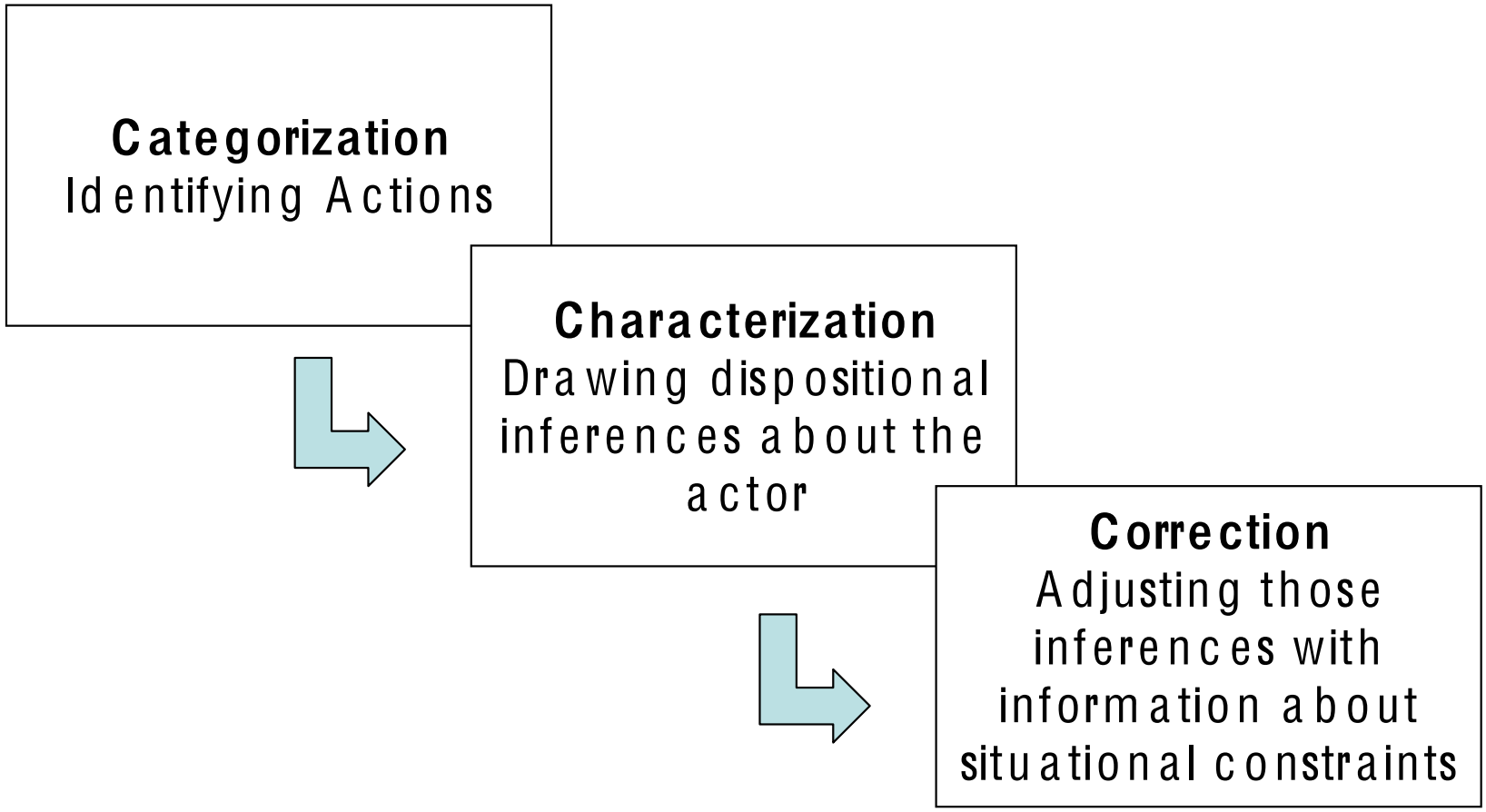
“Castro Study”



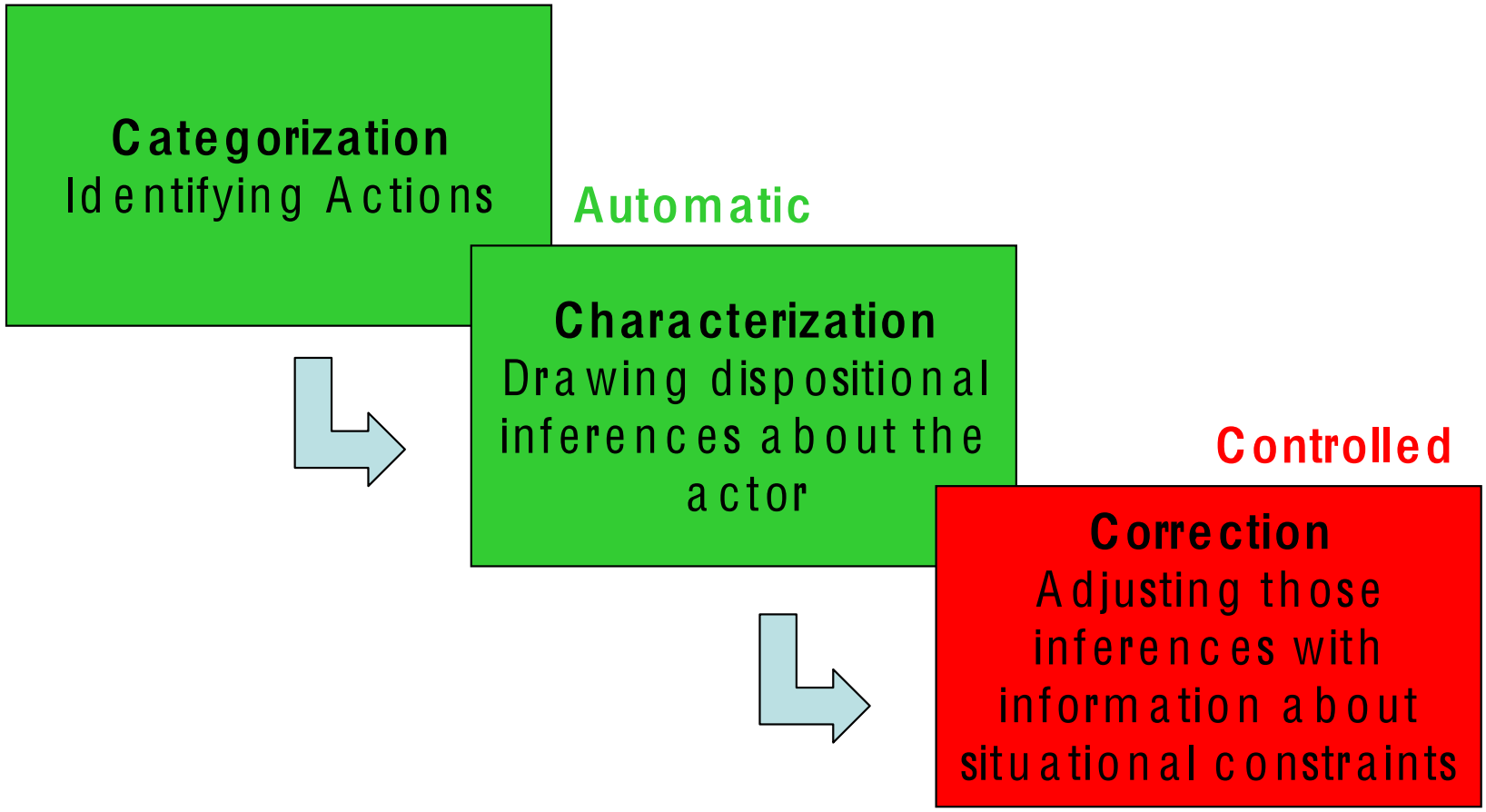
Automatic and controlled processes

- Dispositional inferences are made automatically.
- Situational information is processed in a separate, resource-dependent stage following attribution of behavior to dispositions. This is a controlled process.
- It takes energy and effort to “correct” the initial dispositional attribution.
- Thus, distraction should interfere with ability to take situational influences into account.

Automatic and controlled processes



Automatic and controlled processes



Cognitive busyness

Gilbert, Pelham, & Krull (1988)

- **Participants watched 7 silent video clips of a woman having a discussion with a stranger, she looks extremely anxious in 5 clips, on experimenter-assigned topics.**

- Task: We want you to tell us how anxious this person typically is (dispositional trait anxiety).

- Independent variables: (1) subjects were told the target was discussing anxiety or relaxing inducing topics; (2) subjects were just asked to view the clips (**unregulated**), or were told they would later need to remember the topics (**regulated**).

Cognitive busyness

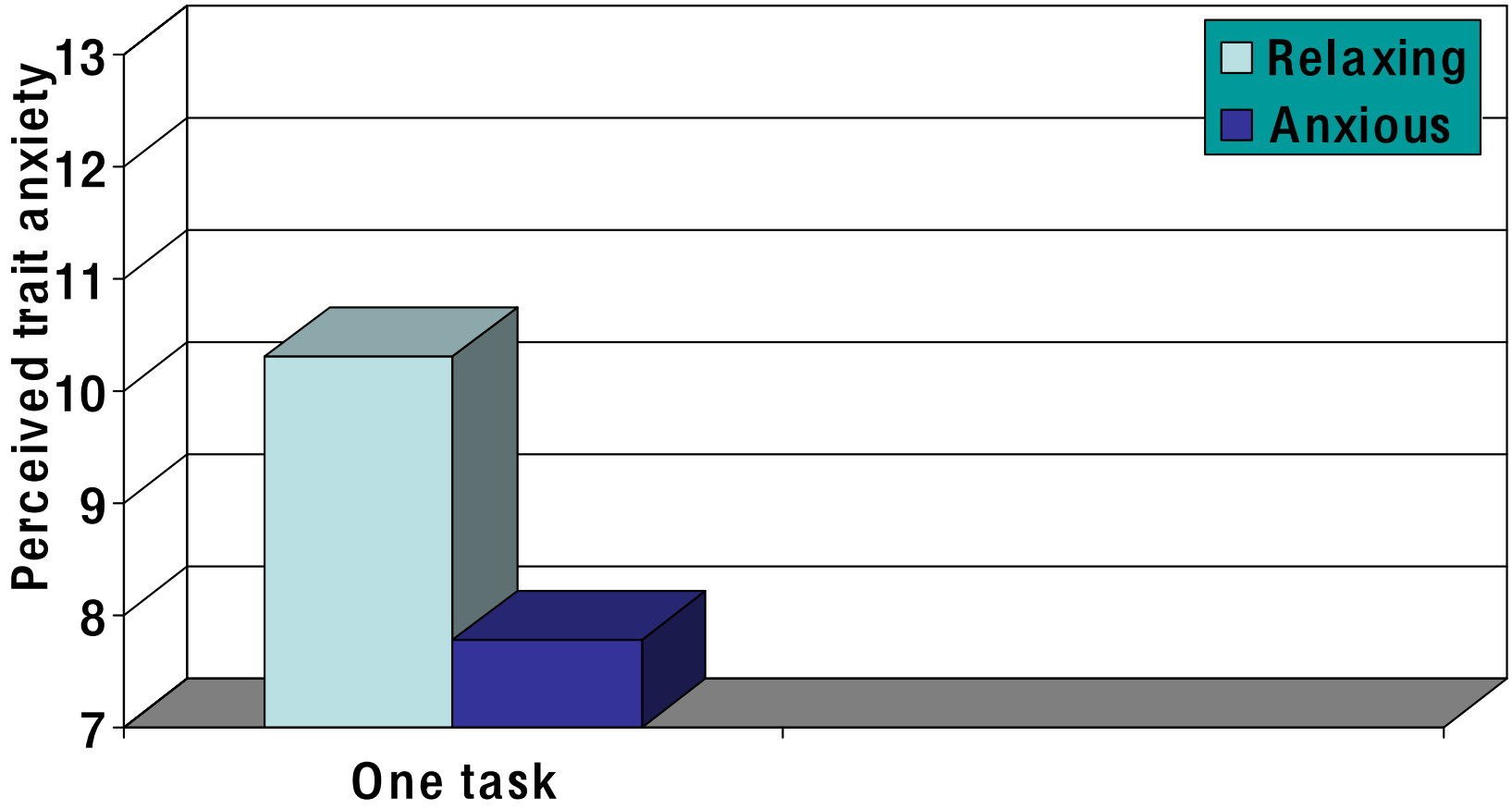
Relaxing topics	Anxious topics	Target's behavior
Fashion trends	Public humiliation	Anxious
World travel	Hidden secrets	Anxious
Great books	Sexual fantasies	Anxious
Favorite hobbies	Favorite hobbies	Relaxed
Foreign films	Embarrassing moments	Anxious
Ideal vacations	Ideal vacations	Relaxed
Best restaurants	Personal failures	Anxious

Cognitive busyness

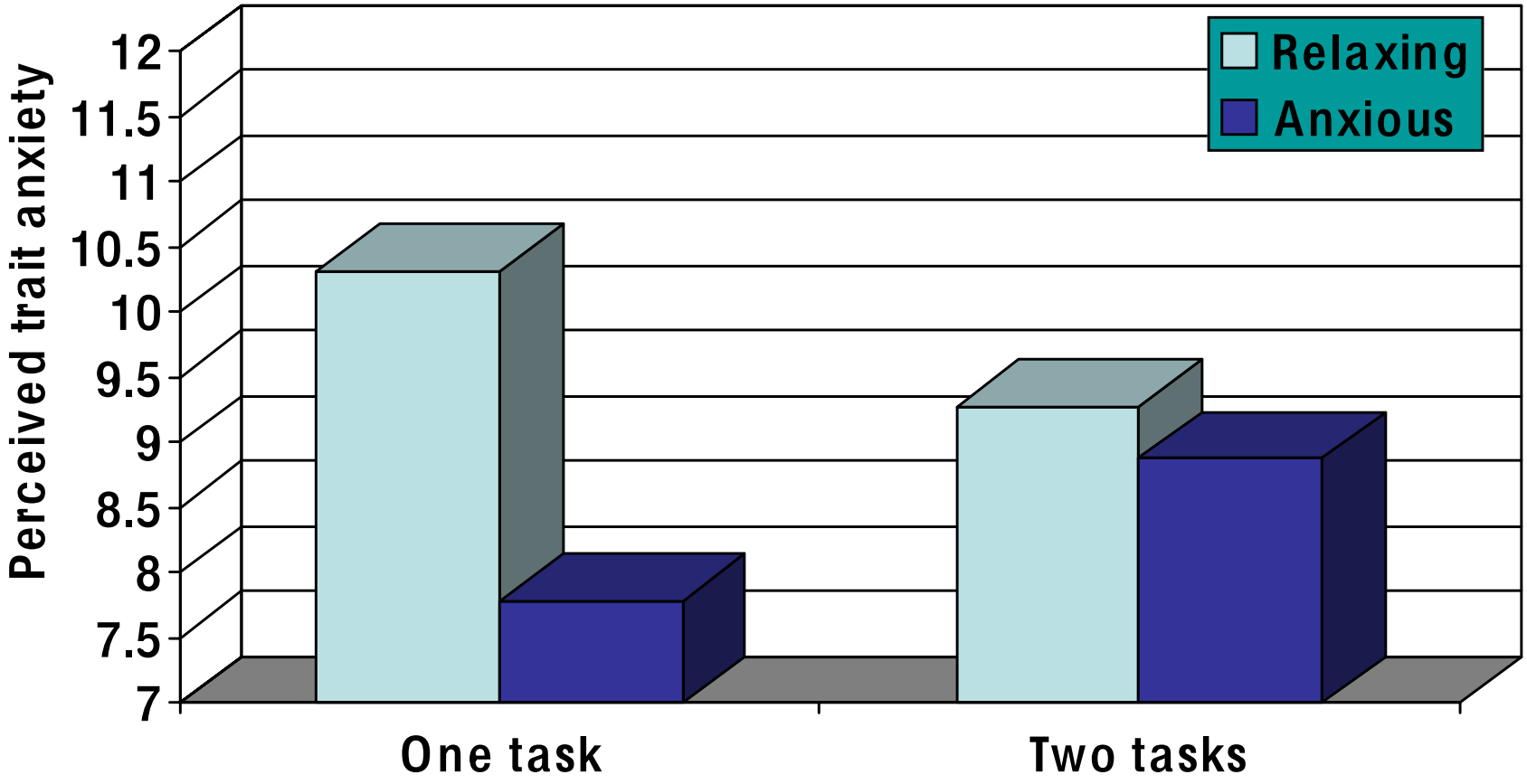
Design = 2 (Topics: Anxious, Relaxing) X 2 (Task: Personality judgments, Personality judgments + Recall topics)

Hypothesis: Participants in the one-task condition would take situational information into account whereas participants in the two-task condition would not.

Cognitive busyness



Cognitive busyness



Two modes of processing

	Automatic Spontaneous Heuristic	Controlled Deliberative Systematic
Efficiency	Quick	Slow
Intention	Not needed	Needed
Control	Difficult to control	Easy to control
Awareness	Unaware of process	Aware of process

Attributions



Public domain image.

Private Lynndie England, who was said to have participated in maltreating and torturing detainees at the Abu Ghraib prison (2004).



Public domain image.

Satar Jabar standing on a box with wires connected to his body.



Public domain image.

Pfc. England holding a leash attached to a prisoner collapsed on the floor, known to the guards as "Gus“.



Public domain image.

Prisoners ordered to form human pyramid.

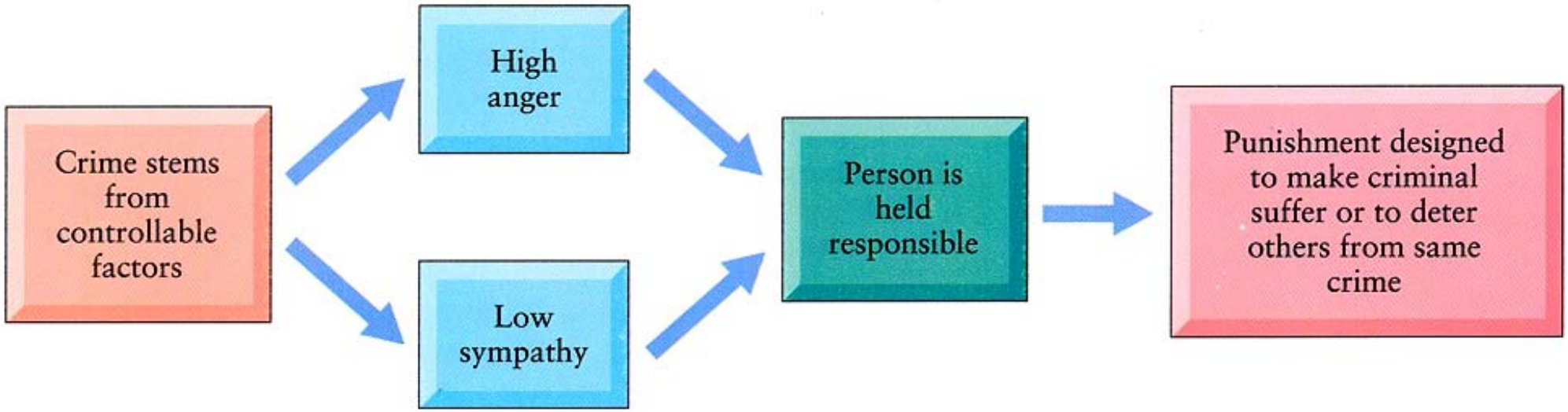


Public domain image.

Lynndie England signals a "thumbs up" sign and points at a hooded, naked Iraqi prisoner's genitals.

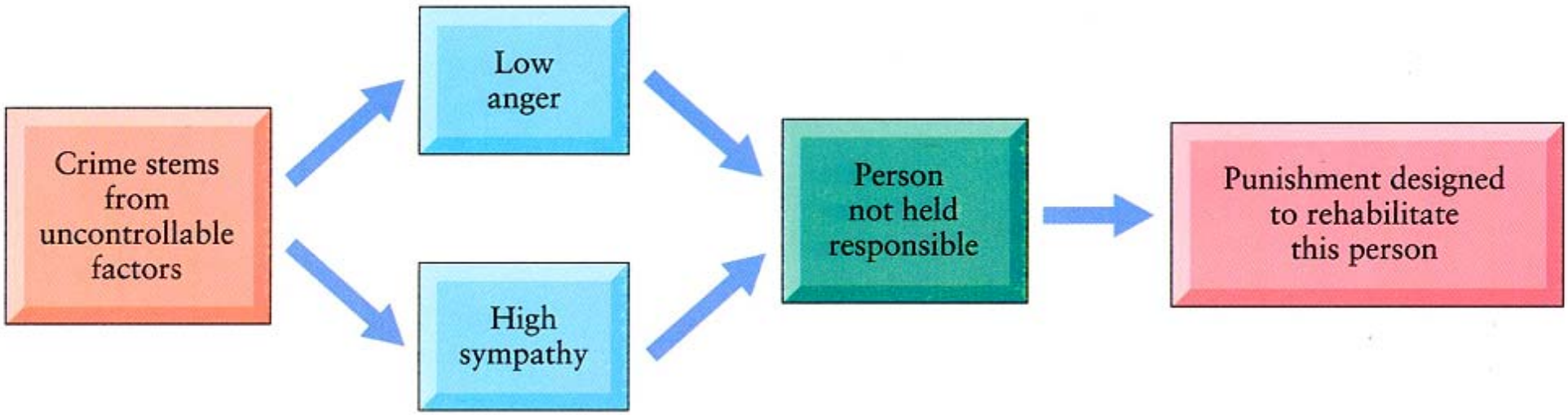
Attributions

Dispositional Attribution (the prosecution): "The accused knew what she was doing. (…) She was laughing and joking. ... She is enjoying, she is participating, all for her own sick humor."



Attributions

Situational Attribution (the defense): England was only trying to please her soldier boyfriend, then-Cpl. Charles Graner Jr., labeled the abuse ringleader by prosecutors. "She was a follower, she was an individual who was smitten with Graner …she just did whatever he wanted her to do."



Attributions



Public domain image.

England was found guilty of one count of conspiracy, four counts of maltreating detainees and one count of committing an indecent act. She was acquitted on a second conspiracy count.

Social influence

A change in a person's behavior or beliefs in response to the intentional or unintentional influence of others.

Three major kinds of social influence

- **Conformity**: Changing one's behavior or beliefs in response to explicit or implicit pressure from others.
- **Compliance:** Changing one's behavior or beliefs to avoid conflict.
- **Obedience**: Changing one's behavior or beliefs in response to the demands of a more powerful person.

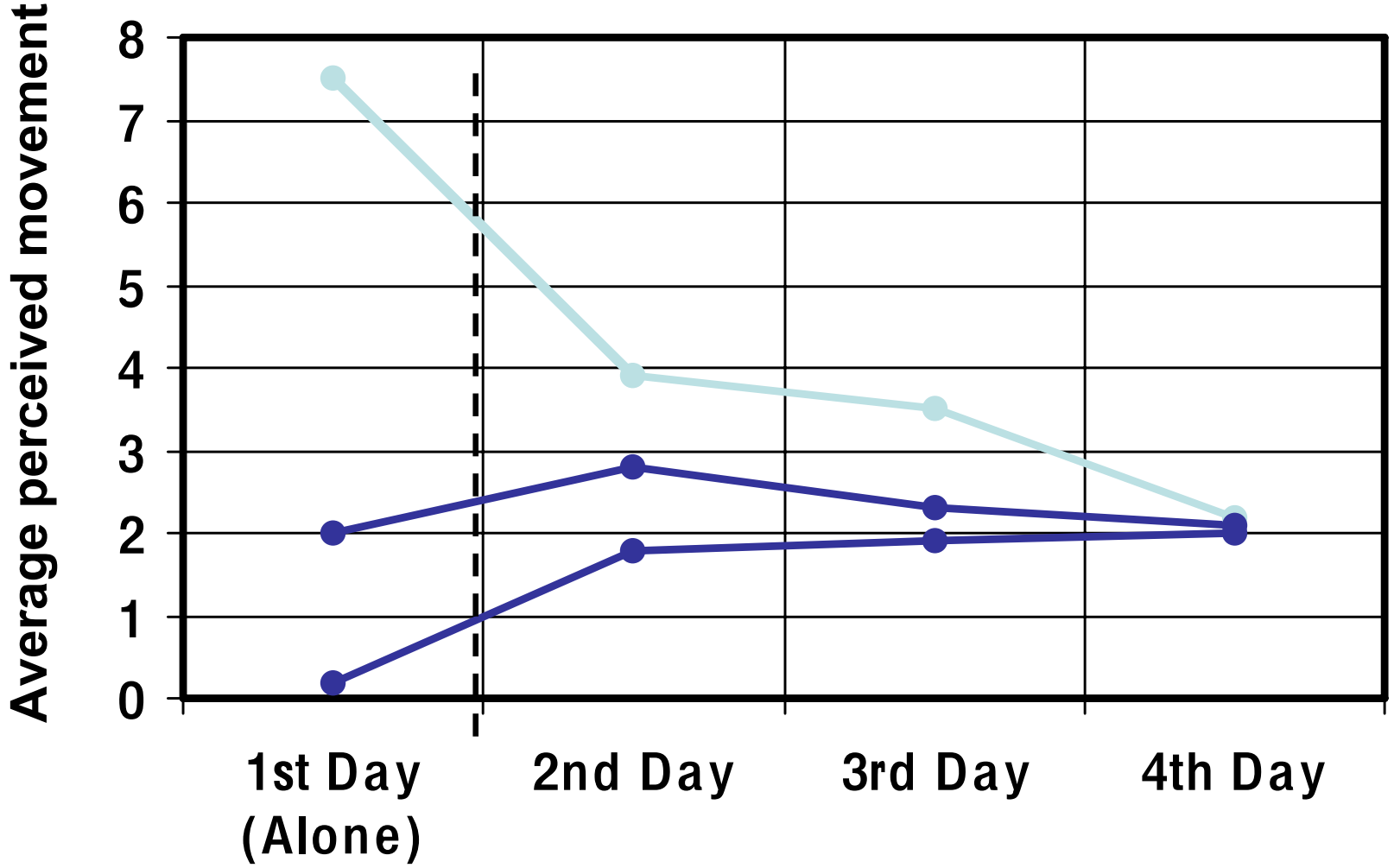
Conformity

- **We conform to implicit as well as explicit social rules.**
- **Conformity is necessary for social coordination, and thus for civilization.**
- **Conformity can be seen across individuals, across the lifespan, and across cultures.**

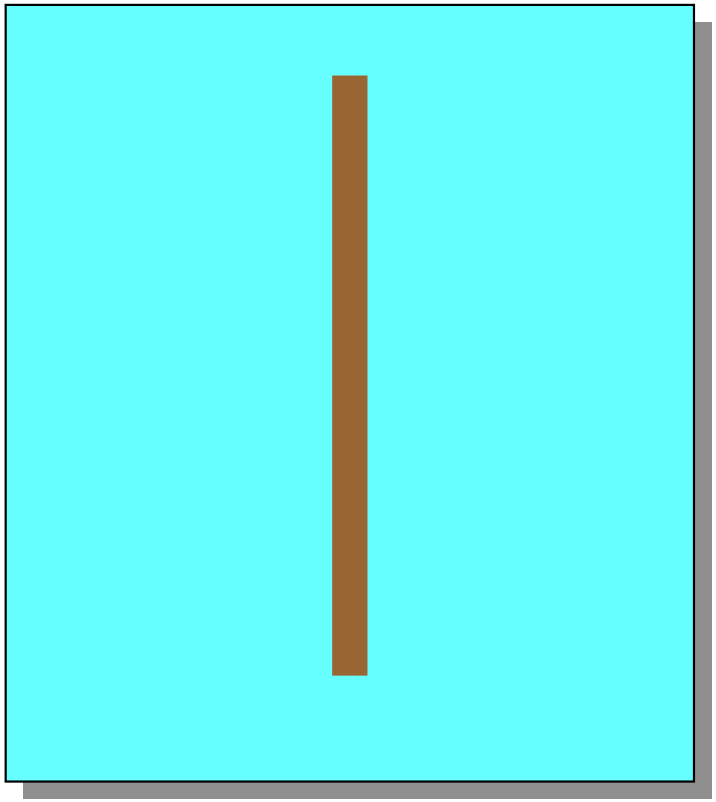
Conformity: Sherif's autokinetic effect

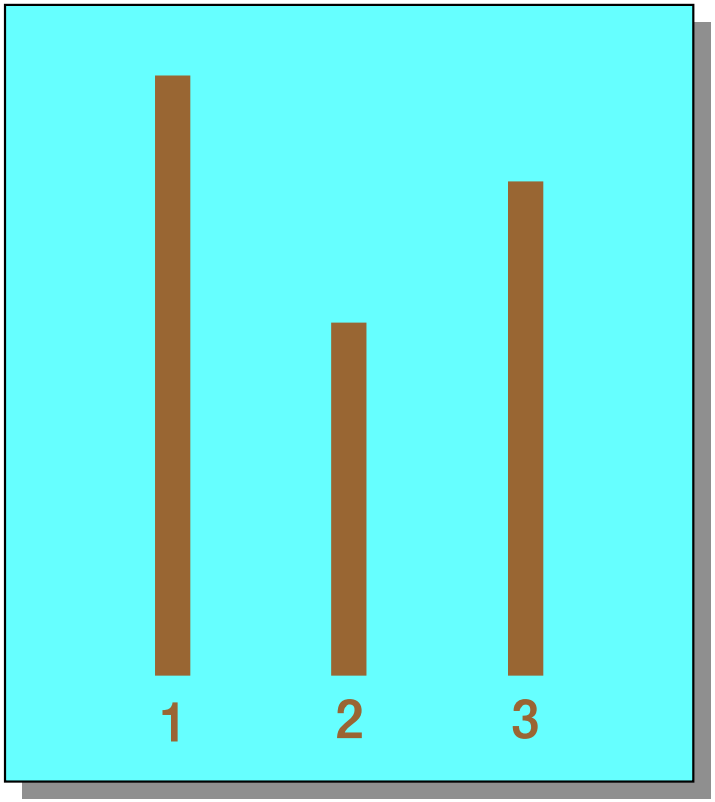
- **Participants reported for a study on visual perception.**
- **They were seated in a dark room and saw a point of light appear, move, then disappear.**
- **Participants were asked to judge how far the light moved.**
- **The light never actually moved – the apparent movement was due to a perceptual illusion known as the "*autokinetic effect*."**

Conformity: Sherif's autokinetic effect

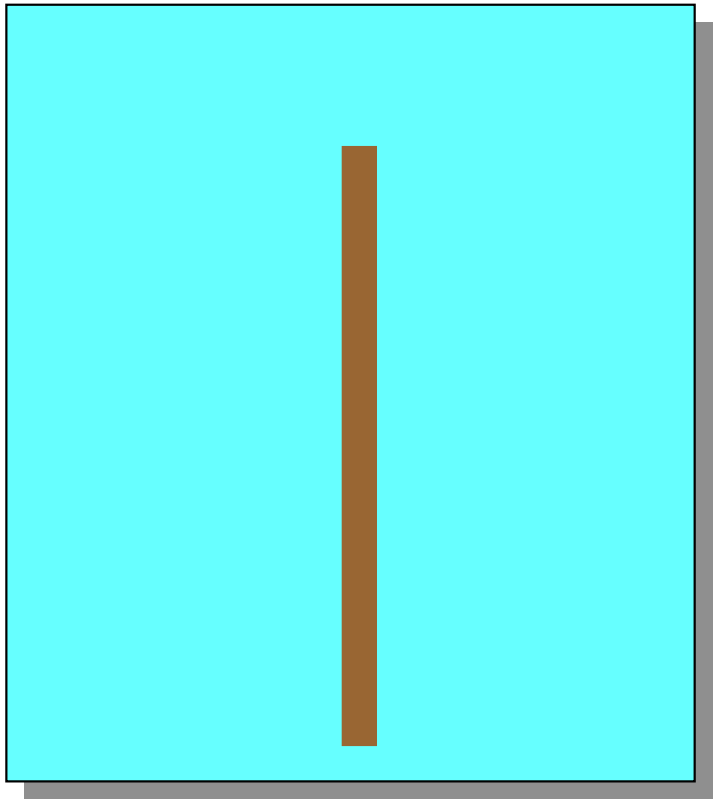


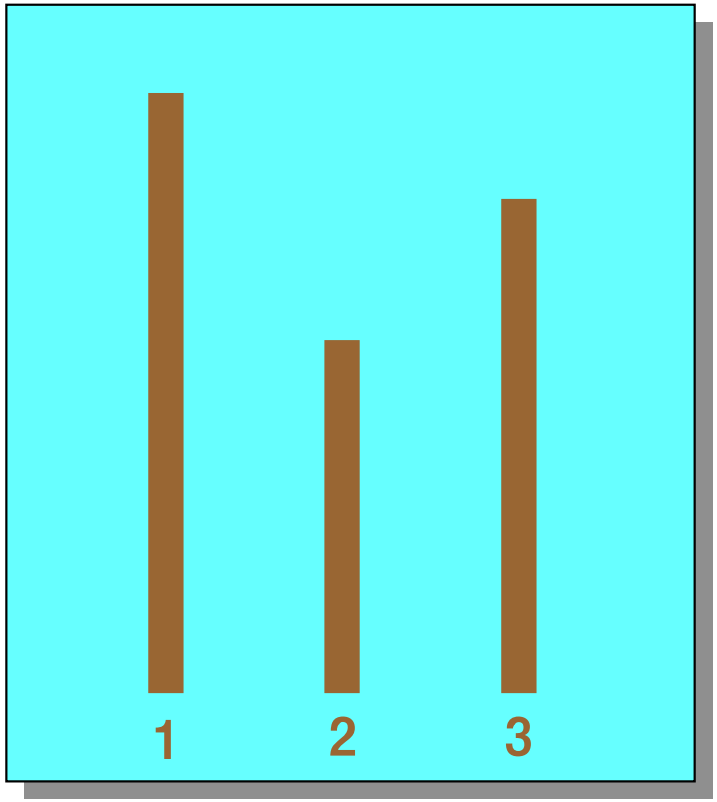
Conformity:
The Asch studies





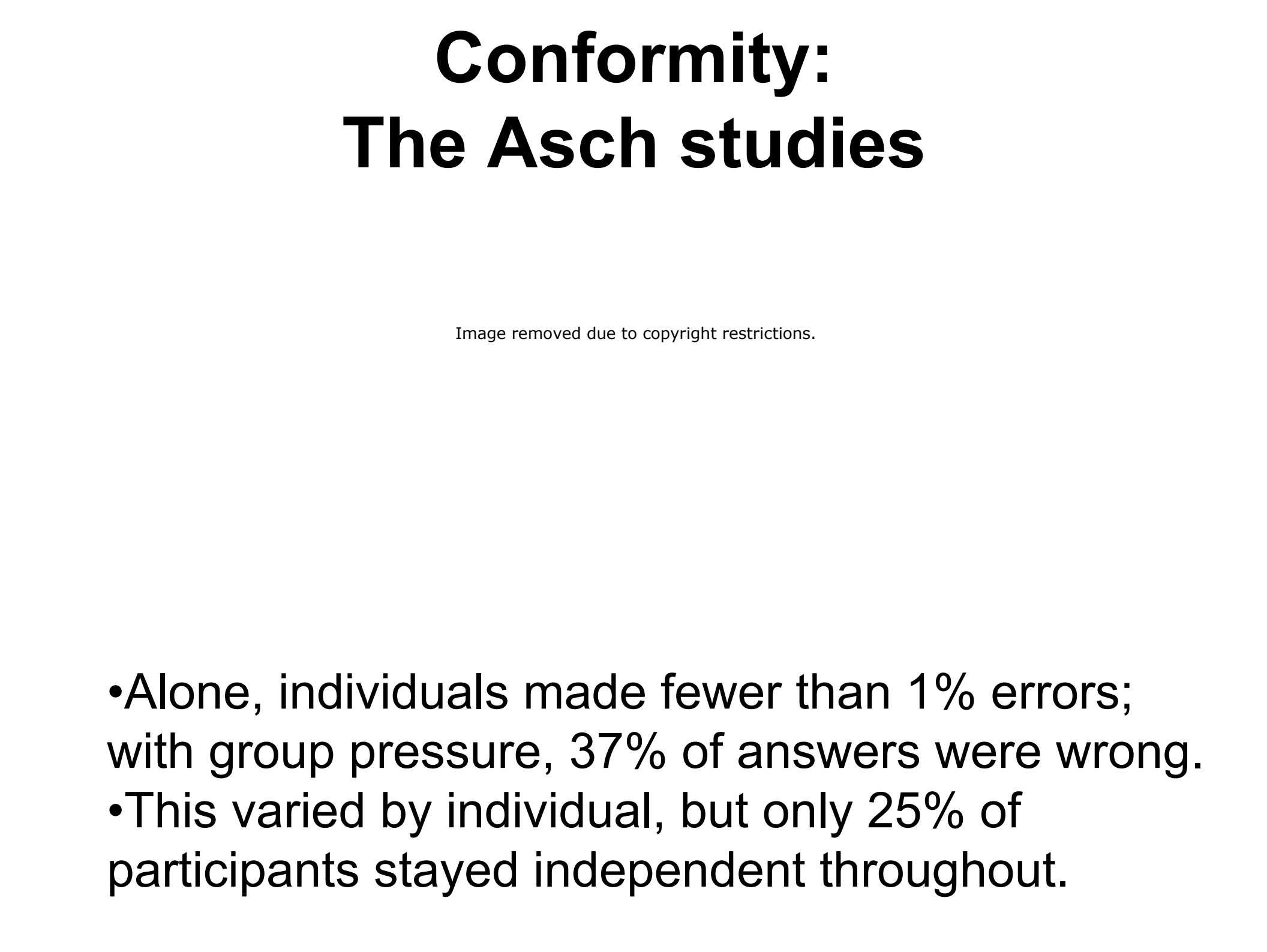
Conformity:The Asch studies





6 confederates go first; then subject; 12/18 trials confederates are wrong;

Conformity:
The Asch studies

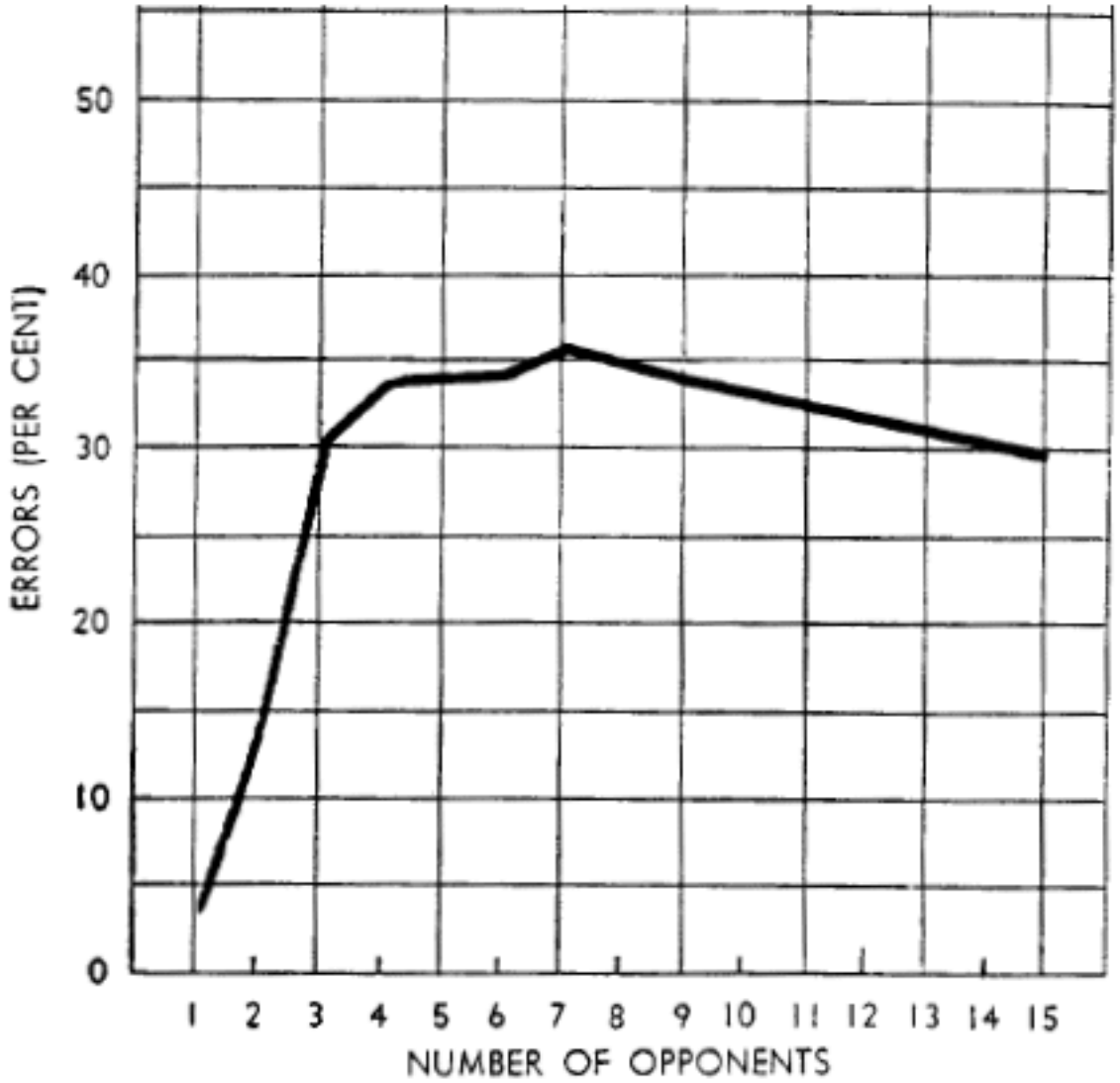


•Alone, individuals made fewer than 1% errors; with group pressure, 37% of answers were wrong.
•This varied by individual, but only 25% of participants stayed independent throughout.

Moderators of conformity

1. Group size

Group size



SIZE OF MAJORITY which opposed them had an effect on the subjects. With a single opponent the subject erred only 3.6 per cent of the time; with two opponents he erred 13.6 per cent; three, 31.8 per cent; four, 35.1 per cent; six, 35.2 per cent; seven, 37.1 per cent; nine, 35.1 per cent; 15, 31.2 per cent.

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Moderators of conformity

1. Group size
2. Presence of an ally

Presence of an ally

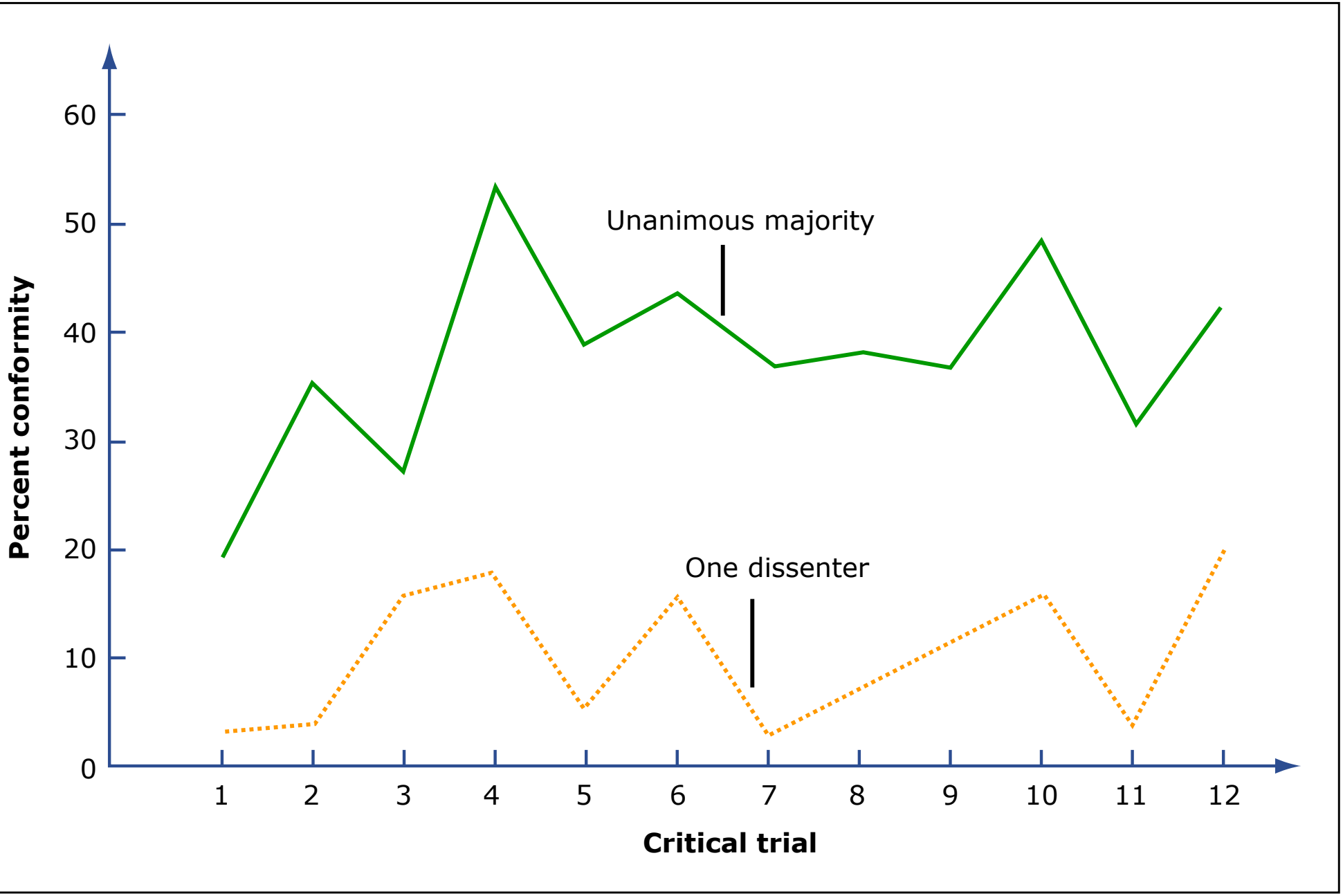


Image by MIT OpenCourseWare.

Moderators of conformity

1. Group size
2. Presence of an ally
3. Avoid embarrassment (arrive late, private response,1/3d less)
4. Demographics

 Age (peak in 9th grade)
 Gender (women)
 Culture (interdependent)

Why do we conform?

- The need to be right
- The need to be liked

Cartoons removed due to copyright restrictions.

Three major kinds of social influence

- **Conformity**: Changing one's behavior or beliefs in response to explicit or implicit pressure from others.
- **Compliance:** Changing one's behavior or beliefs to avoid conflict.
- **Obedience**: Changing one's behavior or beliefs in response to the demands of a more powerful person.

COMPLIANCE

- ***foot-in-the door***

 Freedman & Fraser, 1962

- **drive to homes, show large unattractive DRIVE CAREFULLY sign, will you place on lawn? Less than 20% say yes**
- **first sign petition to support legislation to reduce traffic accidents - a few weeks later, > 50% say yes**
- **need for consistency of behavior**

Obedience

We obey our parents, the police, our bosses, and fire-fighters.

Obedience is necessary for social order, and thus for civilization.

Obedience (in varying levels) can be seen across individuals, across the lifespan, and across cultures.

Obedience



Public domain image.

World War II and the subsequent claims by those who carried out the Holocaust:

They were “just following orders.”

Stanley Milgram

1933 - 1984

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

*No special training, education, or experience is needed. We want:

Factory workers	Businessmen	Construction workers
City employees	Clerks	Salespeople
Laborers	Professional people	White-collar workers
Barbers	Telephone workers	Others

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY, YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus 50c carfare) if I participate.

NAME (Please Print).

ADDRESS

TELEPHONE NO. Best time to call you

AGE OCCUPATION SEX
CAN YOU COME:

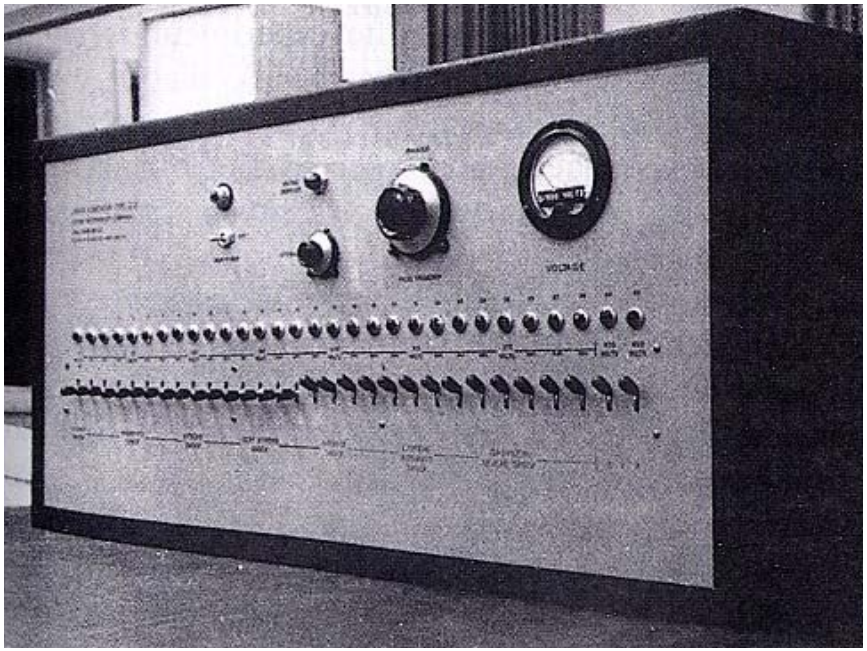
WEEKDAYS EVENINGS WEEKENDS

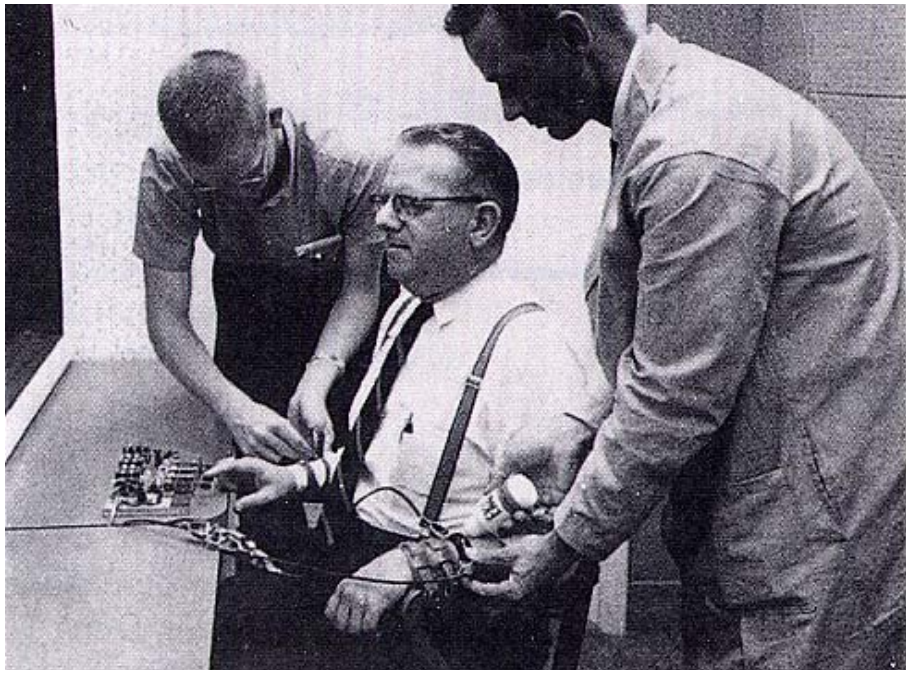
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CONFORMITY & OBEDIENCE: MILGRAM STUDY

Newspaper ad - study of memory - Yale
Two people
Researcher - here to help science improve learning and memory through punishment
One "teacher" (subject) and one "learner" (confederate) - a set of word pairs to memorize
Teacher gives word, student responds
Correct response - "good" or "that's right"
Incorrect response - - press button that delivers shock

Milgram's obedience studies





Teacher sampled 45-volt shock

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Milgram's obedience studies

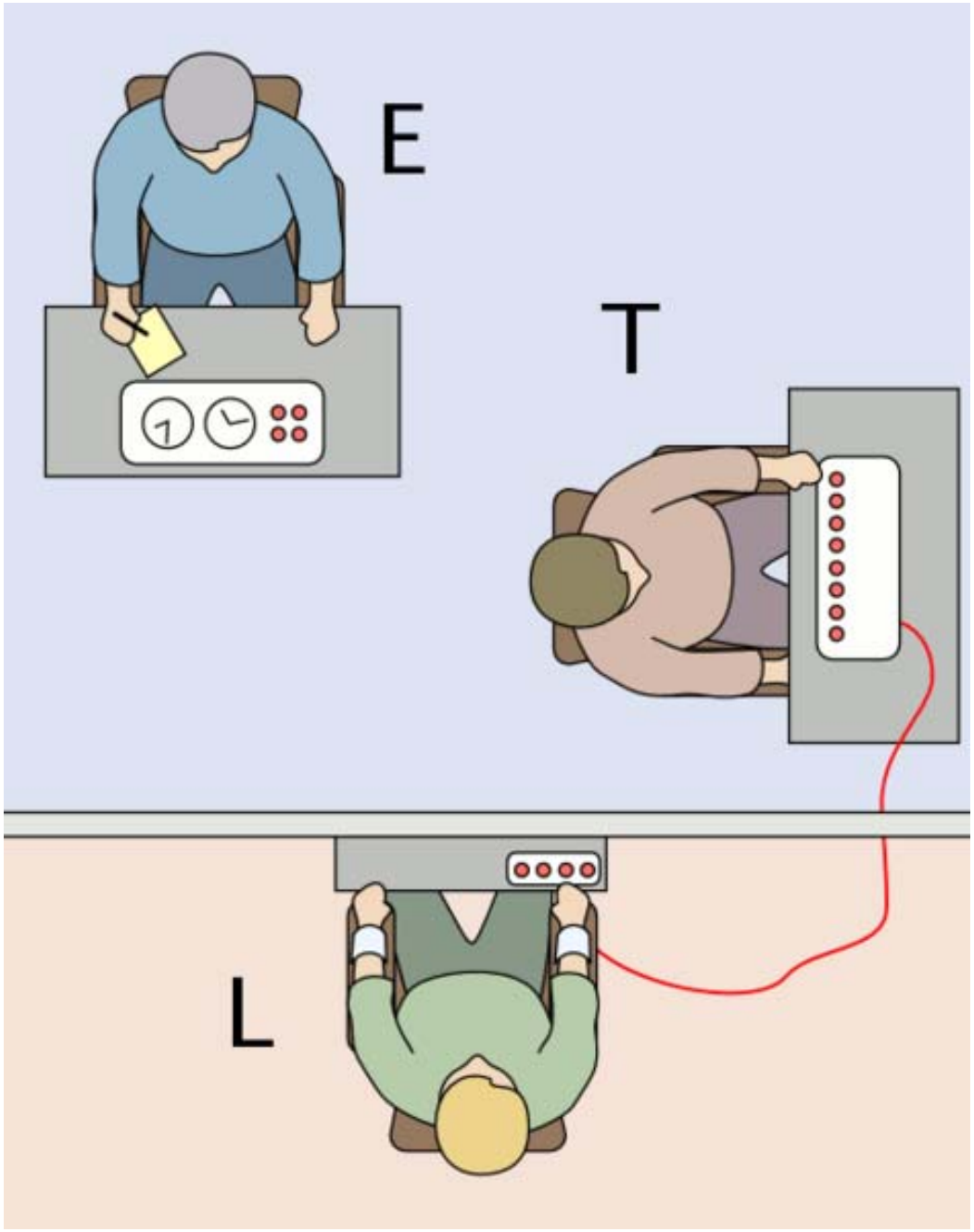


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CONFORMITY & OBEDIENCE: MILGRAM STUDY

Shock Generator
15 volts - 15 volts steps - 30 switches
150 volts - “STRONG SHOCK”
255 volts - “INTENSE SCOCK”
375 volts - “DANGER, SEVERE SHOCK”
435 volts - “XXX”
450 volts - “XXX”

CONFORMITY & OBEDIENCE: MILGRAM STUDY

Initially,learner does well; Then errors occur
Learner complains that shocks are starting to hurt
Screams
Says that he or she does not want to continue
Hesitate, question researcher
Learner complains about her condition
More errors - teacher pleads to concentrate
“You have no right to keep me here!”
“I refuse to answer any more! You can’t hold me here! My heart is bothering me!”
At 300 volts, refused to answer
Experimenter says that after 5 sec, it is a wrong answer
At 350 volts, silence

CONFORMITY & OBEDIENCE: MILGRAM STUDY

Shock Generator
15 volts - 15 volts steps - 30 switches
150 volts - “STRONG SHOCK”
255 volts - “INTENSE SCOCK”
375 volts - “DANGER, SEVERE SHOCK”
435 volts - “XXX”
450 volts - “XXX”

All the way to 450?

CONFORMITY & OBEDIENCE: MILGRAM STUDY

Shock Generator
15 volts - 15 volts steps - 30 switches
150 volts - “STRONG SHOCK”
255 volts - “INTENSE SCOCK”
375 volts - “DANGER, SEVERE SHOCK”
435 volts - “XXX”
450 volts - “XXX”

All the way to 450? - experts 1-3% (psychopaths)
me? No!

CONFORMITY & OBEDIENCE: MILGRAM STUDY

Shock Generator
15 volts - 15 volts steps - 30 switches
150 volts - “STRONG SHOCK”
255 volts - “INTENSE SCOCK”
375 volts - “DANGER, SEVERE SHOCK”
435 volts - “XXX”
450 volts - “XXX”

All the way to 450? - 65%

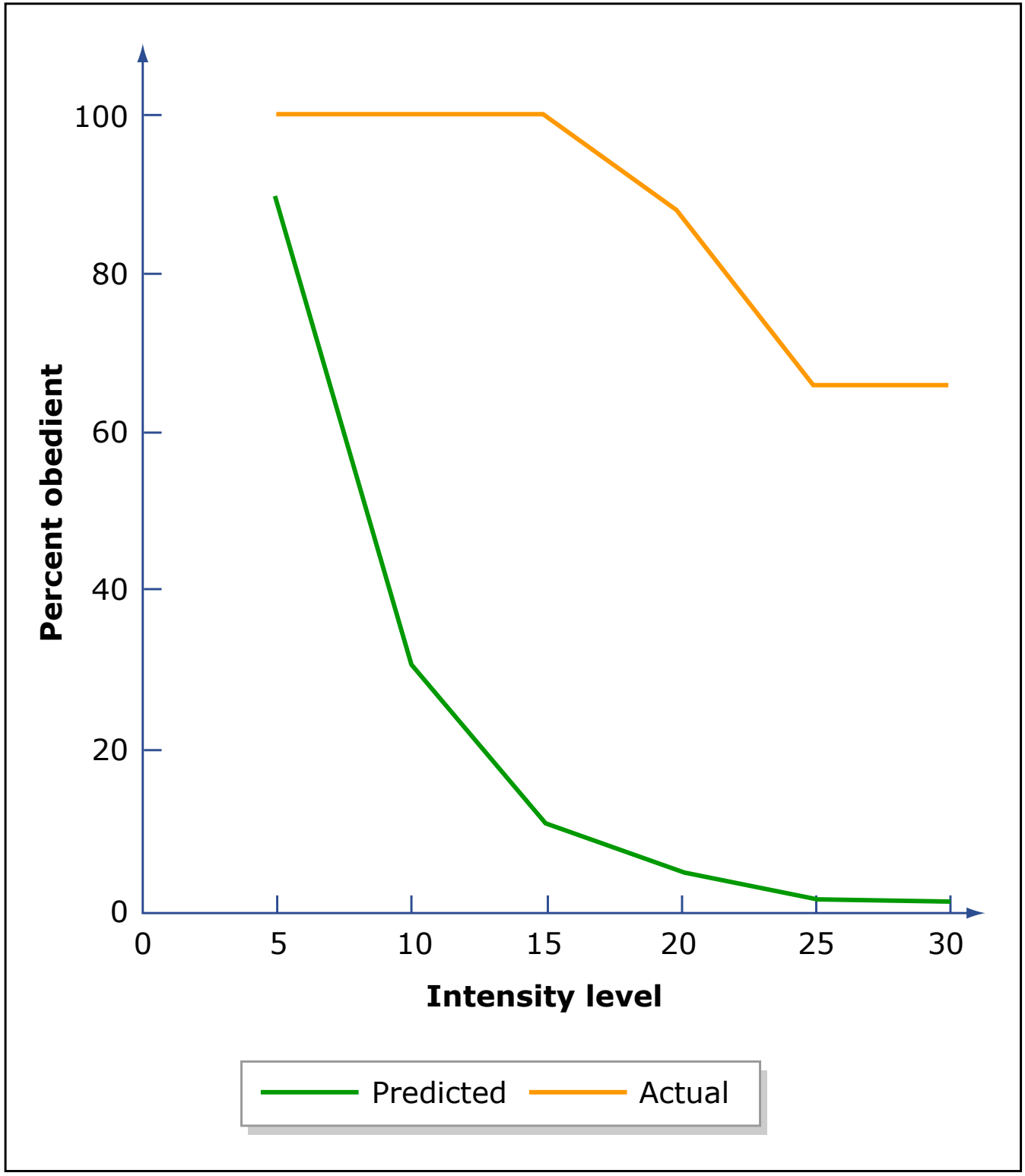


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Milgram's obedience studies

- **Prior to the study, a panel of experts agreed that only a tiny fraction of participants would give the highest level of shock in this context.**

- **The key finding: fully 65% of participants actually gave the highest level of shock.**

- **Many participants expressed discomfort, but not a single participant effectively disobeyed (100% to 100 v).**

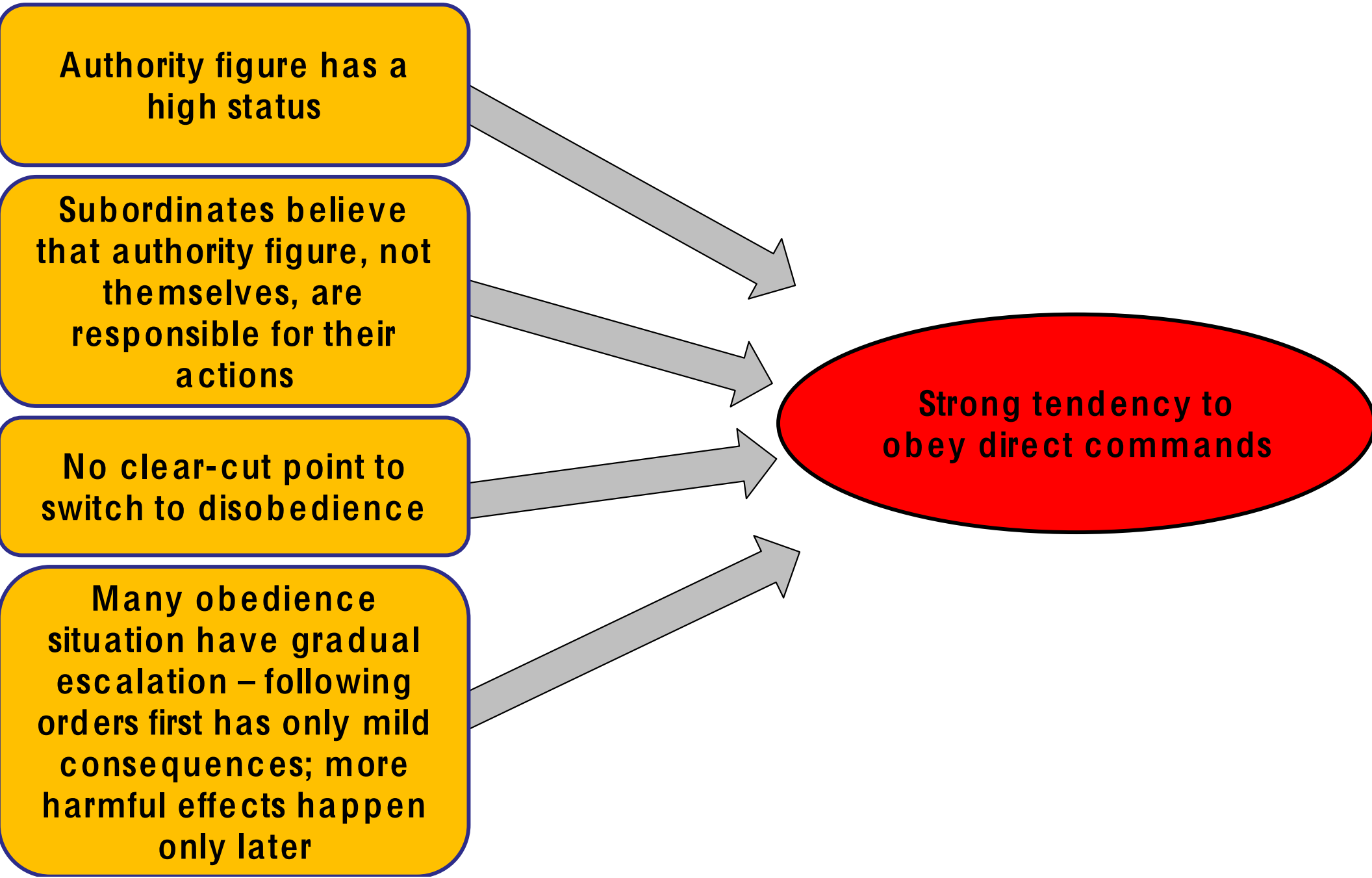
WOULD THIS HAPPEN TODAY (WOULD YOU DO THIS)?

- Burger, 2009
- screened subjects
- told 3 times that they could stop and still get $50 for participating
- instant debriefing
- clinical psychologist present - end session if subject seemed distressed
- stop at 150 volts as good estimate

WOULD THIS HAPPEN TODAY (WOULD YOU DO THIS)?

- Burger, 2009
- Milgram - 79% went to 150 volts
- now - 70%
- no difference between men and women

Why are we so obedient?



Moderators in Milgram's studies

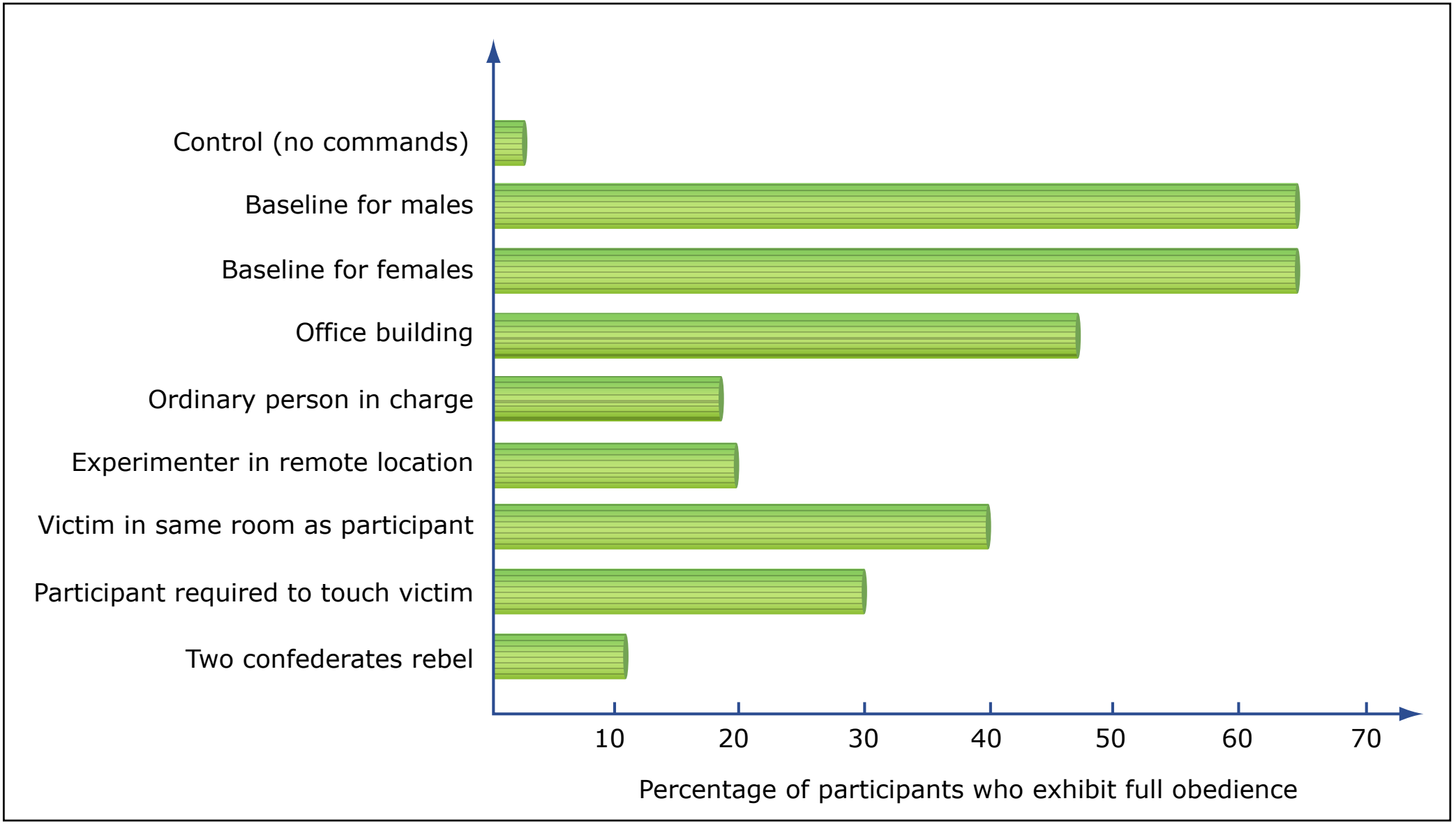


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Stanford Prison Experiment

- Social situations are governed by implicit and explicit rules (or norms).
- To explore how these rules create social reality, Zimbardo enrolled 24 healthy volunteers in a two-week “study of prison life.”
- Participants were randomly assigned to be either “guards” or “prisoners.”
- Guards became sadistic, and prisoners had such extreme stress responses that the study was terminated after only 6 days.

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Stanford Prison Experiment (1971). Guards marching prisoners on a toilet run, bags over their heads, legs chained together.

Planned as two-week prison simulation. Study ended prematurely after six days. The guards were escalating their abuse of prisoners in the middle of the night when they thought no researchers were watching. Prisoners were showing signs of extreme psychological stress and distress.

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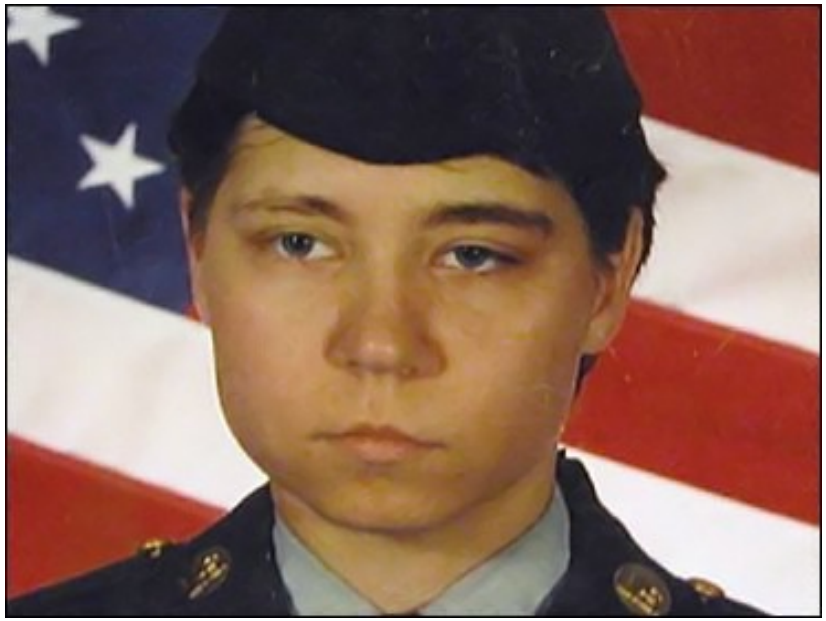


Two months after the study, here is the reaction of prisoner #416 who was placed in solitary confinement for several hours by guards:

"I began to feel that I was losing my identity, that the person that I called "Clay," the person who put me in this place, the person who volunteered to go into this prison -- because it was a prison to me; it still is a prison to me. I don't regard it as an experiment or a simulation because it was a prison run by psychologists instead of run by the state. I began to feel that that identity, the person that I was that had decided to go to prison was distant from me -- was remote until finally I wasn't that, I was 416. I was really my number."

Stanford Prison Experiment

http://bit.ly/sYPFyJ



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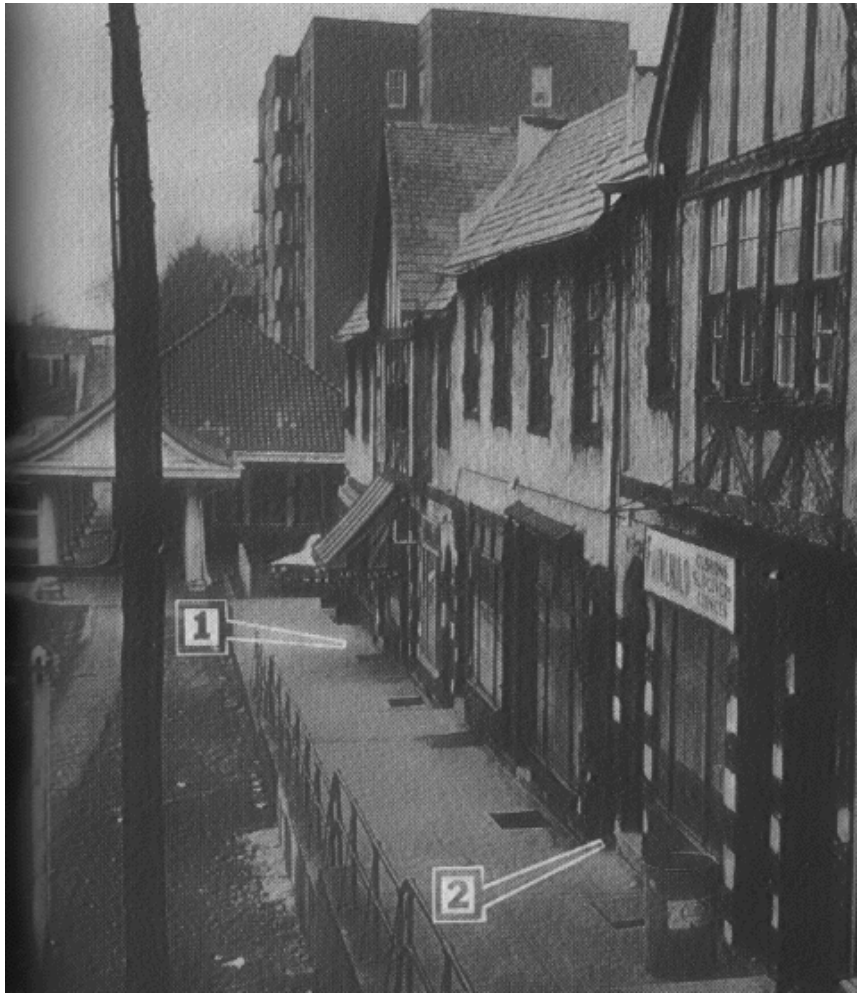
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SOCIAL PSYCHOLOGY: *THE POWER OF THE SITUATION*

- **Attribution - dispositional/situational**
- **Fundamental Attribution Error**
- **Conformity**
- **Compliance**
- **Obedience**
- **Bystanders and Helping**

The bystander effect





Kitty Genovese

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The bystander effect

- Selfish voyeuristic bystanders?
- Apathy of urban culture?
- Anonymity of modern life?
- Fear of getting hurt?

…or is it something else?

… what would YOU have done?

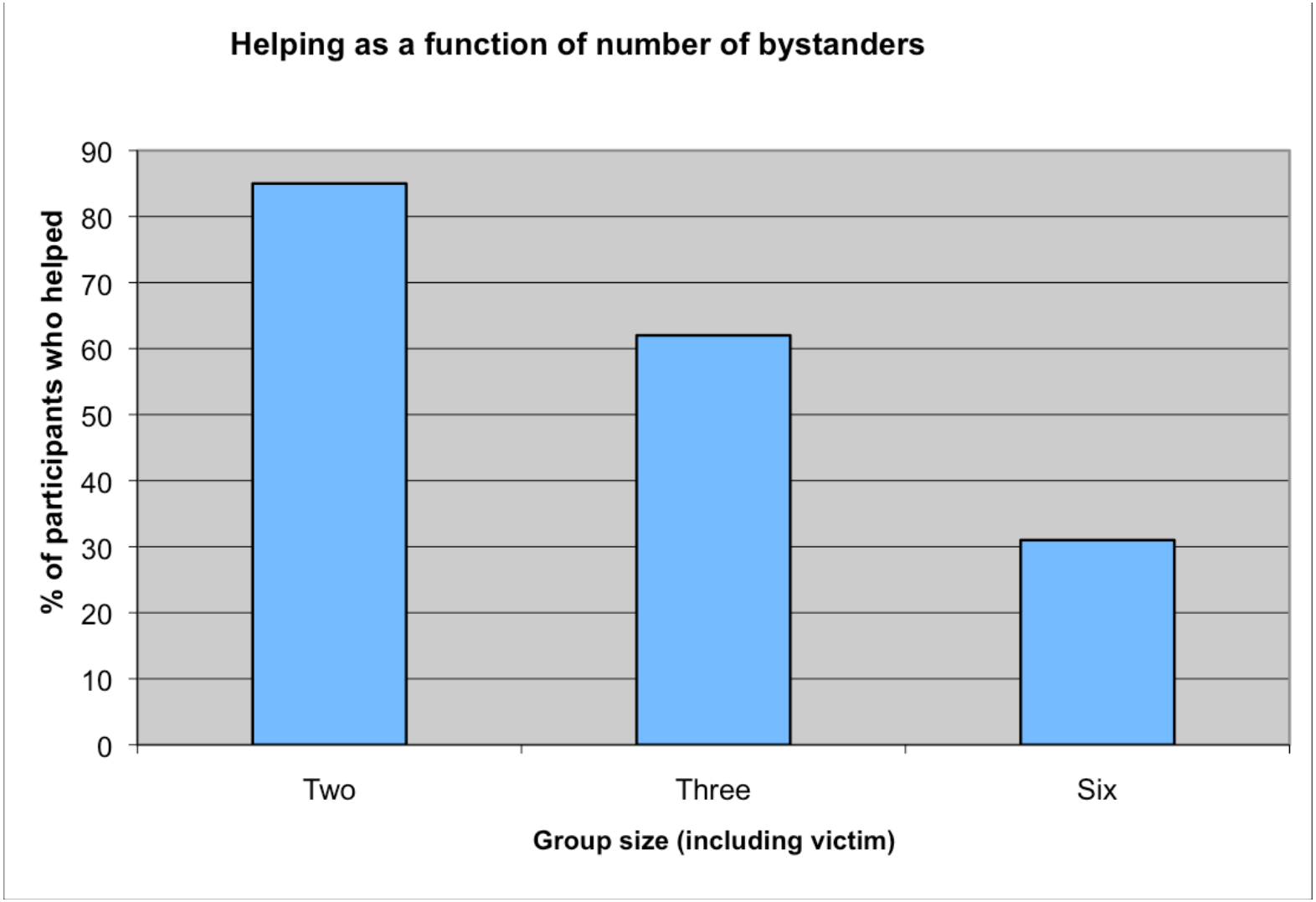
The bystander effect

- Latane and Darley conducted a series of experimental studies.
- **Pluralistic ignorance**: Each witness was uncertain whether there was a real emergency, saw the others not reacting, and decided it must not be a real emergency.
- **Diffusion of responsibility**: Each person felt someone else must be getting help, if help is in fact needed.

HELPING SOMEONE HAVING A SEIZURE

- Darley & Latane, 1968
- arrive for an experiment to discuss personal problems - 1-4 people over an intercom - one member (confederate) appears to have a seizure

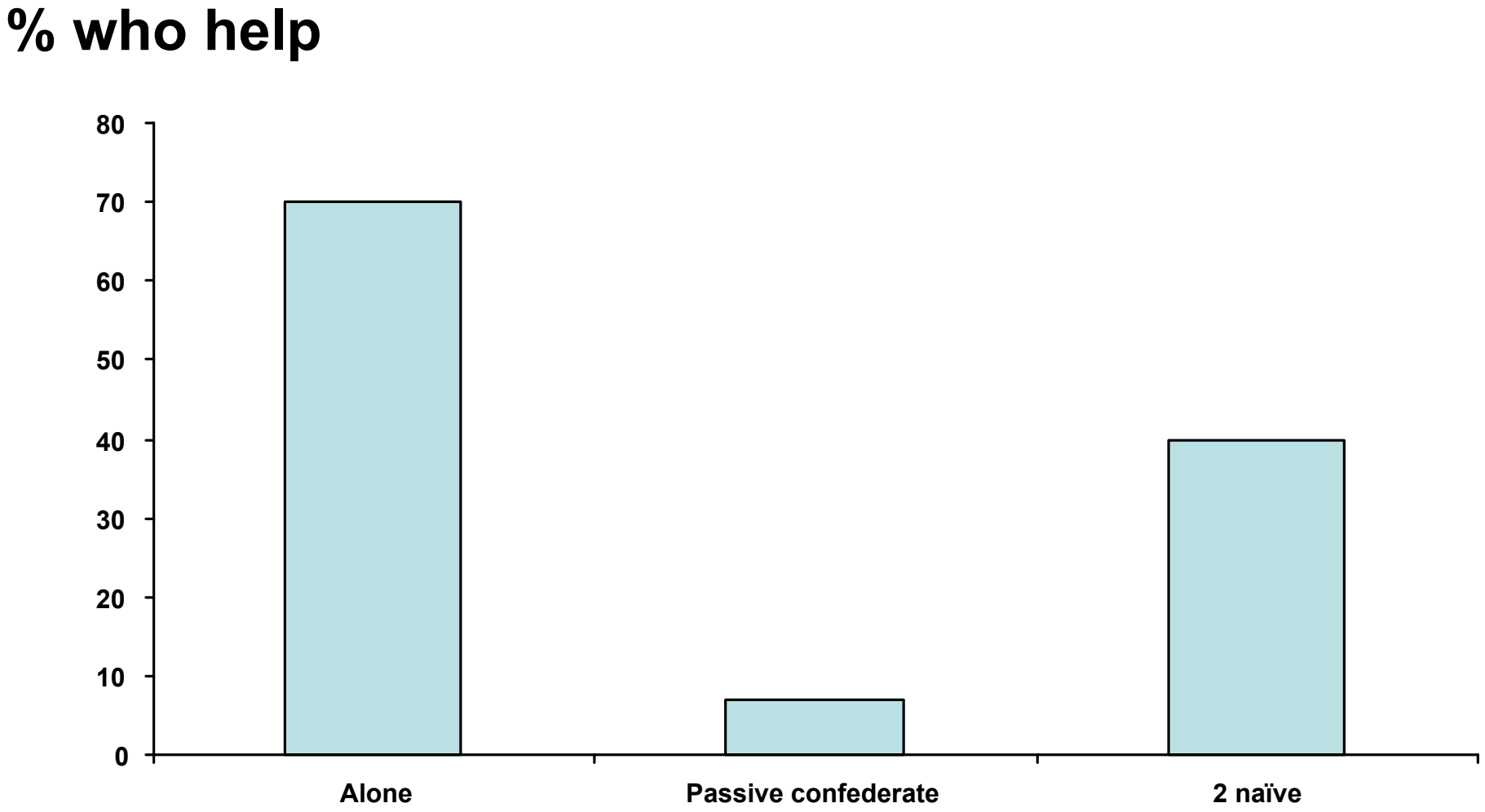
HELPING SOMEONE HAVING A SEIZURE



A LADY IN DISTRESS

- subject waits alone, or with a passive confederate, or with a friend
- room separated by a curtain
- experimenter goes to the other room,
 turns on tape recording of fall,
 moaning
- who goes to look and help?

The bystander effect: A lady in distress



(Latané & Darley, 1970)

WHERE THERE IS SMOKE, IS THERE FIRE?

- subject fills out surveys
- smoke enters room through vent
- alone, in a group of three, or with two confederates who noticed but ignored smoke, or a friend
- who leaves the room to get help within 6 minutes?

The bystander effect: Where there's smoke, there's a fire

Alone - 75%
With 2 passive confederates - 10%
With 2 naïve subjects - 12.5% by individuals
(38% by group)
With friend - 75%

(Latané & Darley, 1970)

GOOD SAMARITAN

- Princeton seminary students; surveys about religious values
- told to present talk about seminary jobs or a sermon on the "Good Samaritan"
- either ahead, on time, or late
- see slumped man in doorway
- who stops to help?

Darley & Batson, 1973

GOOD SAMARITAN

- **who stops to help?**
 - **personality - little influence**
 - **sermon - no influence**
 - **ahead - 63% help**
 - **on time - 45% help**
 - **late - 10% help**

Darley & Batson, 1973

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SOCIAL PSYCHOLOGY II

John Gabrieli

9.00

SOCIAL PSYCHOLOGY II

- Self Concept
 - Above Average
 - False Consensus
 - Cognitive Dissonance
- Impressions of Others
- Cultural Differences
- Autism

ENHANCING OUR VIEWS OF OURSELVES

- most U.S. college students rate themselves as better than average students
- 1 million high-school students rated their leadership; 28% average; *70% above average*; 2% below average; 60% in top 10% in ability to get along with others
- 94% of college instructors rated themselves as better than average teachers

ENHANCING OUR VIEWS OF OURSELVES

- self-serving attributional bias

 success reflects our traits, not situation

- did well on tests of sensory or perceptual discrimination, social sensitivity, competitive game - me

 (poorly, the situation)

- can be extended to family, social and political groups, sports teams

Constructing social reality

•In the final game of the season, an undefeated Princeton played Dartmouth. It was a hard fought game, and Princeton won.

•School newspapers had totally different accounts.

•Hastorf and Cantril (1954) showed a film of the game to students at each of the two campuses.

•Princeton students judged the game as dirty, thought Dartmouth started the dirty play, and “saw” Dartmouth commit twice as many penalties.

•Dartmouth students saw both as blameworthy, and “saw” an equal number of penalties on each side.

Realistic Depression & Illusory Optimism

- depressed and non-depressed students given tasks that varied in degree of contingency (Alloy & Abramson, 1979)
- estimate degree of contingency between response (button presses) and outcome (green light going on)
- depressed students more accurate, non-depressed students overestimated contingency when outcomes were desired, underestimated when outcomes were undesired

False Consensus (Ross et al., 1977)

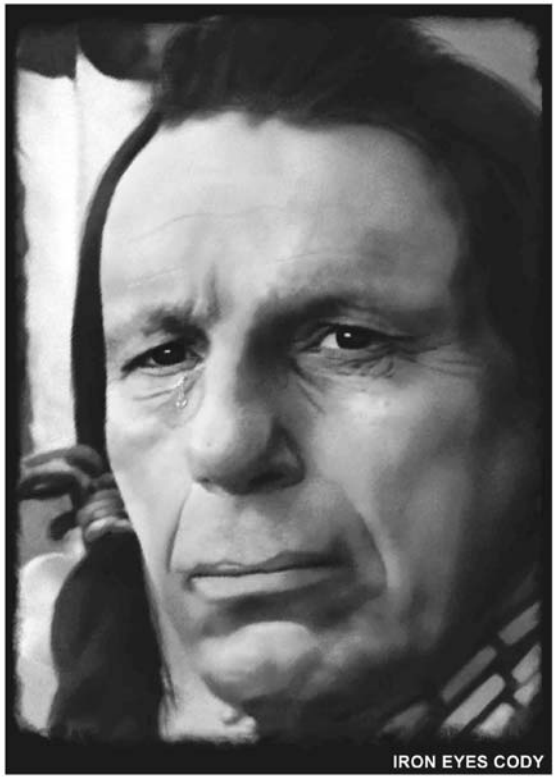
- People choosing to engage in a behavior believe that their choice is more common than do people making the opposite choice
- Carry around sign on campus "Eat at Joe's" for 30 min - agree, 62% of others will do so; disagree, 33% of others will do so
- Example: Teenage smokers estimate higher rates of smoking than non-smokers (Sherman et al., 1983); domestic abusive men estimate that about 28% of men have violently thrown things at partner (vs. 12%) (Neighbors et al., 2010)

WHAT HAPPENS TO THE CAR?

- Zimbardo (1980)
- two identical cars - one in upper-middle class Palo Alto; one in tough Bronx area
- Bronx - no license plate; hood up; stripped within a day
- Palo Alto - untouched for a week - smashed a window - stripped within an hour

Use the force for good not evil....

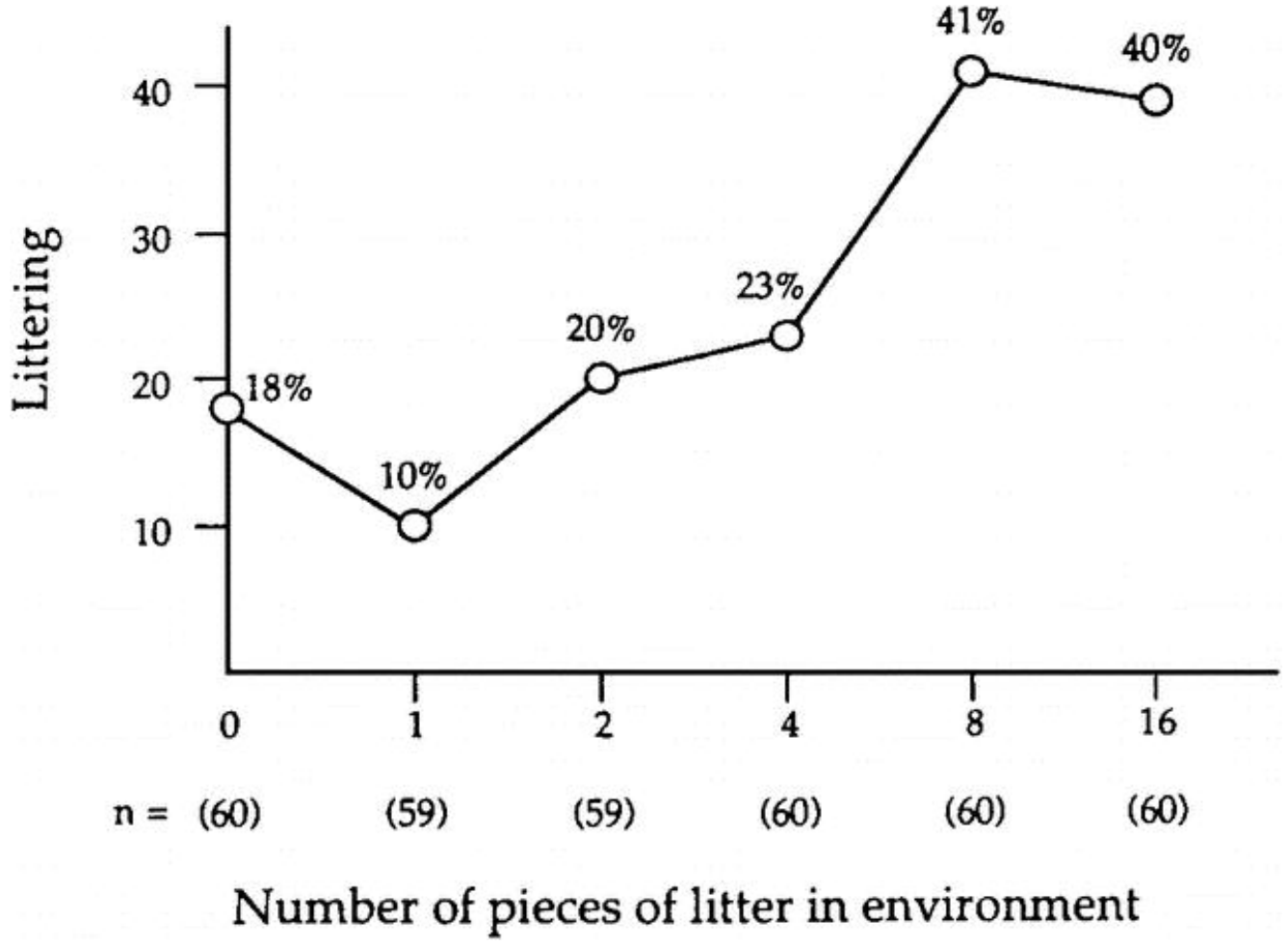
Can you increase compliance with a prosocial request?



Is this ad persuasive?
What is presented as the norm?

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Social Norms & Littering



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Using norms to influence recycling

descriptive norms (what most others do)

injunctive norms (what most others approve or disapprove of)

See recycling
Approve recycling
Disapprove a person who does not
25.3% increase in recycling amount



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Attitudes vs. Actions

- Daffodil Days - buy a daffodil - 4-day campus event to benefit American cancer Society
- 251 Cornell students

 83% predicted they would buy at least one flower vs. 56% of peers

 43% actually bought a daffodil

COGNITIVE DISSONANCE

- Leon Festinger, 1957
- discrepancy between attitudes and action (behavior) - conflict
- do a boring task (packing & unpacking spools in a tray, turning many screws for a quarter turn)
- get $1 or $20 to lie and tell next person that task was interesting, worthwhile
- really, how was task?

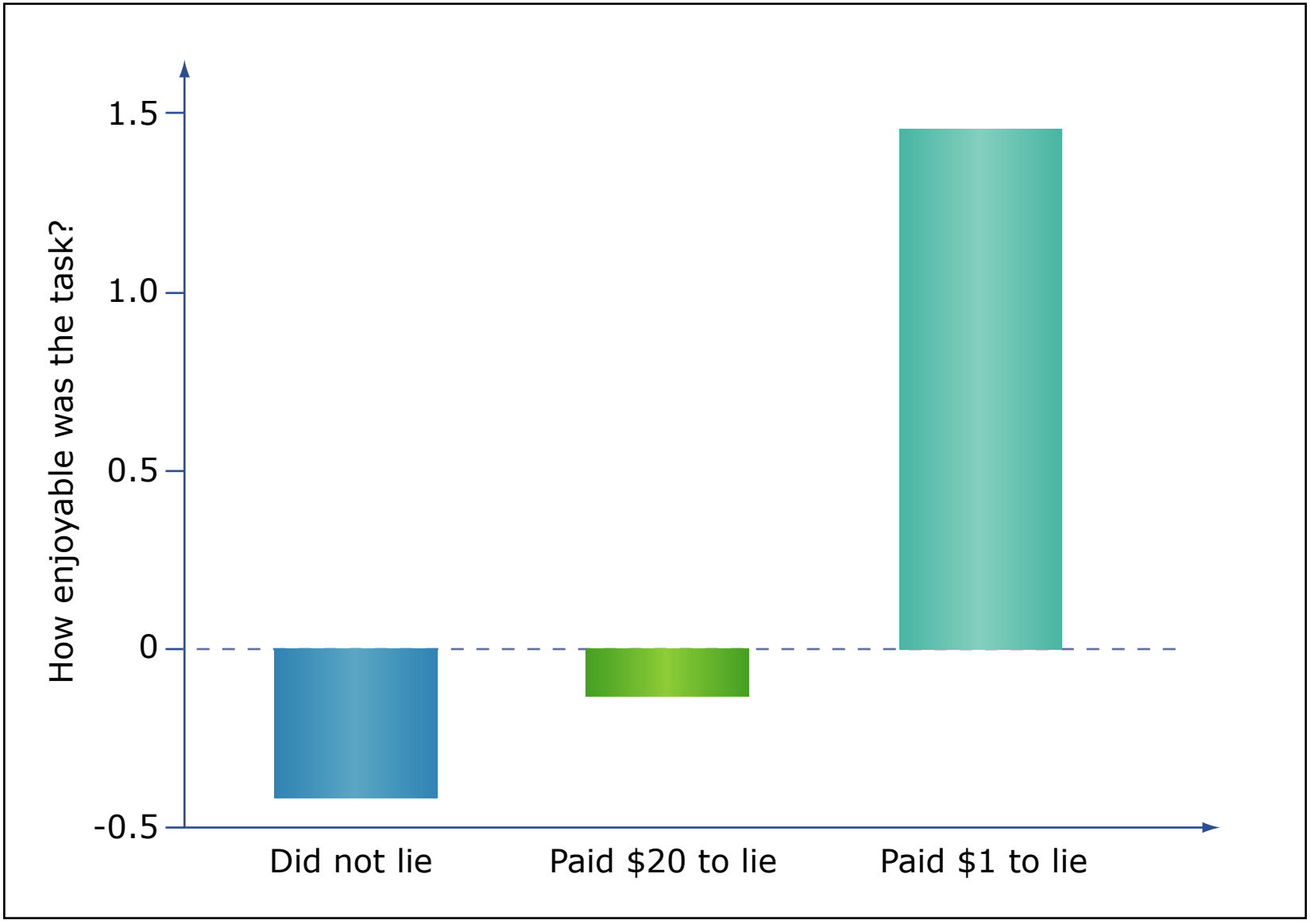


Image by MIT OpenCourseWare.

COGNITIVE DISSONANCE

- ***post-decisional***

Jack Brehm, 1956, carted wedding gifts to lab

rate how much you want desk lamp, toaster, stopwatch, radio, etc.

select between two that were equally desirable

rate again - upgraded the chosen item, downgraded rejected item (unless examiner picks for them)

- ***colleges, cars vs. trucks, CDs***

COGNITIVE DISSONANCE

- **effort**

courses

1959 - to qualify for a research study, some women were required to read aloud obscene words or mild words to male experimenter - then listened to boring lecture on mating habits of lower animals - lecture rated better by difficult qualification

why did I do that painful thing?

First Impressions

How powerful?

How accurate?

First Impressions

How powerful?

How accurate?

Operational Definition

Norman & Goldberg (1966), University of Michigan

- **Students rate people's personality on first day of class before introduction**
- **Correlation with self-rating, especially "sociable" and "responsible"**

Kenny (1988)

- **250 students, divided into 4 groups who did not know each other, had not spoken together**
- **Rated - *sociable*, good-natured, *responsible*, calm, intellectual (traits of extraversion, conscientiousness) - good agreement with self ratings**
- **But how good are we at rating ourselves?**

Self ratings? (Levesque & Kenny, 1993)

- **4 strangers rate each other on 5 traits**
- **Meet in pairs, videotaped**
- **Judges watched tape, rated extroversion - time talking, arm movements**
- **First impressions correlated strongly with videotape ratings for selves & others**

Nalani Ambady (1993) - *"thin slices"*

- **Videotaped 13 graduate TAs**
- **3 random 10 sec clips, 30 sec per TA**
- **Showed silent clips to students**
- **13 ratings - accepting, active, competent, confident**
- **Correlated global rating with actual end-at-semester rating with students**
- **+ 0.76 correlation**
- **15 sec? 6 sec?**

• listen to 20 secs of physician speaking during routine office visit, above-chance prediction of which were sued for malpractice

High school teachers?

Better teachers?

5 students - 1 “teacher” - teachers prepared brief math lesson - students took test - strangers rate 10 sec videos of teachers

High rating correlated with high test-scores

First Impressions

Prior information (Schema)

MIT 1950

Guest lecturer

- 50% students

-"People who know him consider him to be a (very warm or rather cold) person, industrious, critical, practical, and determined."

guest appears, leads 20-minute discussion

Evaluation (very warm)

- Rated lecturer better

- Took more part in discussion

First impressions hard to change because new information is interpreted to be consistent with already formed impressions

First Impressions

Prior information

self-fulfilling prophecy

- **elementary school, gave test to students**
- **told teacher who would have good/bad year**
- **end of year: high scores > low scores**

First Impressions

Prior information

self-fulfilling prophecy

- **elementary school, gave test to students**
- **told teacher who would have good/bad year**
- **end of year: high scores > low scores**

Physical Attractiveness

Physically attractive people judged more intelligent, competent, sociable and moral

5th grade teachers given report cards and photographs of children they did not know

- **Rate intelligence and achievement**
- **Attractive children rated brighter and more successful than unattractive children with identical report cards**

Physical Attractiveness

Child's misbehavior

- **Environmental circumstances if more attractive personality if less attractive**

Court cases, comparable crimes

- **Shorter sentences if more attractive**
- **Longer sentences if less attractive**

Halo Effect

- **global evaluation about a person bleeds over to a specific trait**

she is likable, so she is intelligent

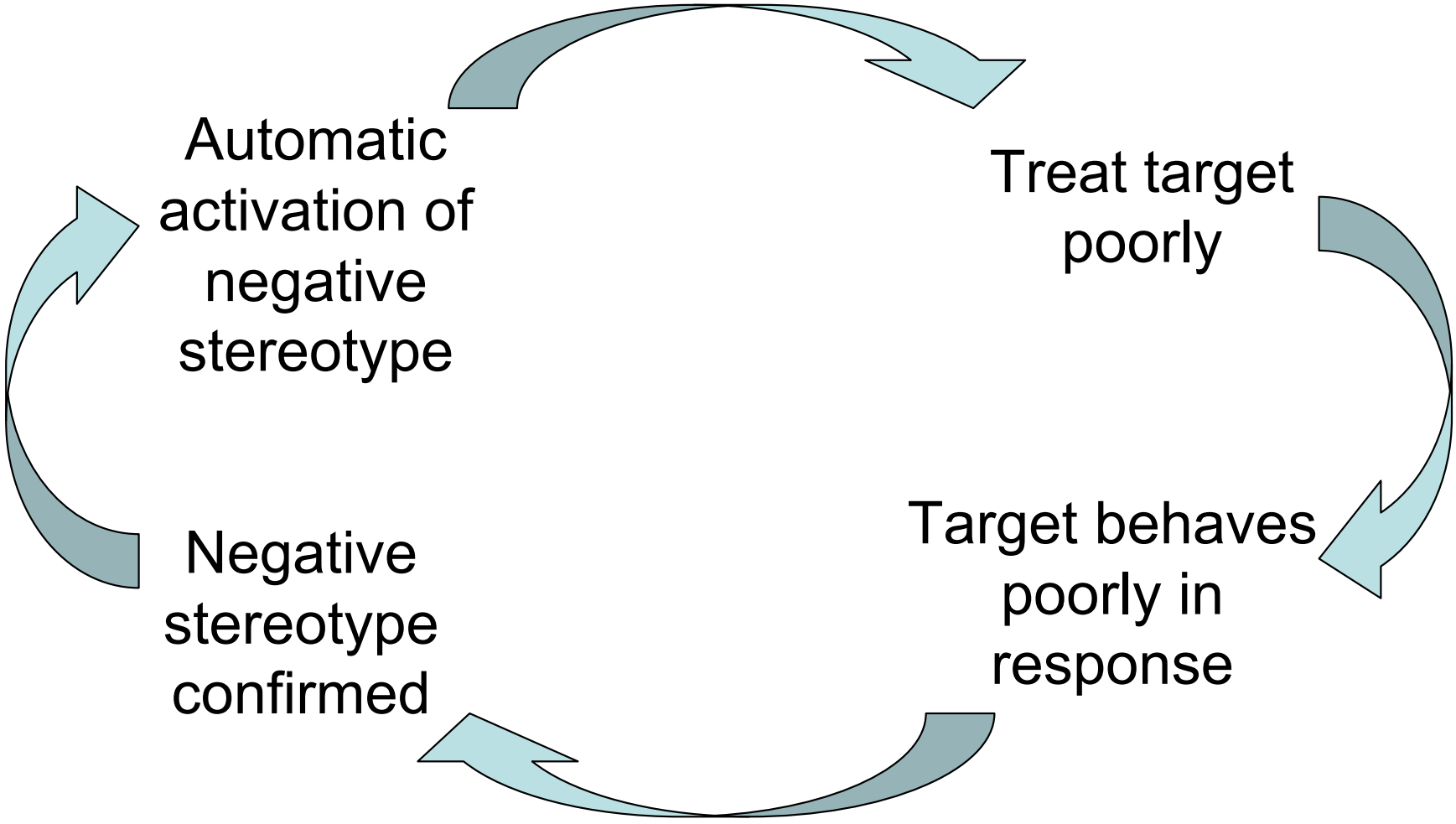
Halo Effect

- **Nisbett & Wilson, 1977 -"cover story" - students told study was to examine teacher evaluations; was it dependent on amount of exposure (cover)?**
- **2 groups saw videos of lecturer with strong Belgian accent - answered questions in a warm & friendly manner or a cold and distant manner**
- **rated warm version as more attractive, likeable mannerisms, & less accent - without being aware of it (celebrity marketing?)**

Stereotypes

- In addition to asking "Why did he do this?" we also ask "What kind of person is he?"
- To answer this question, we rely on short cuts and heuristics
- These short cuts are necessary, but also can lead to stereotyping, or using simplified social schemas to define whole groups of people.
- Stereotypes have bi-directional effects

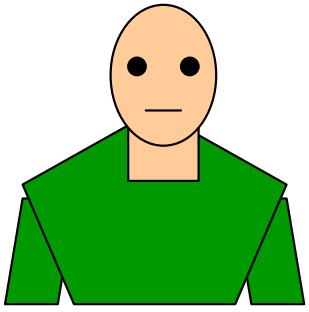
Self-fulfilling prophecies

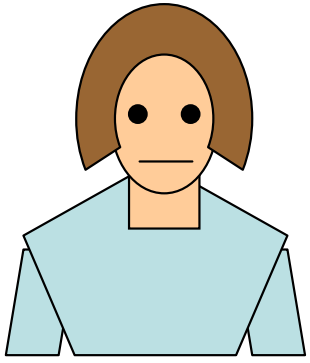


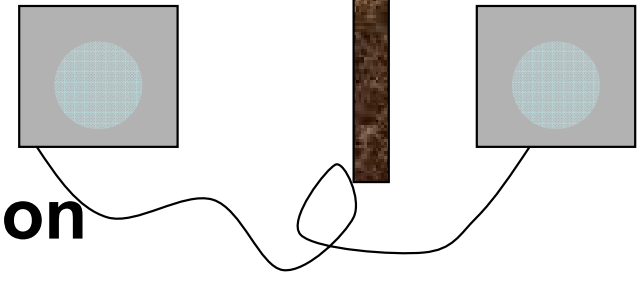
Beauty in the *ear* of the beholder?



Step 1







initial impression
10 min conversation impression

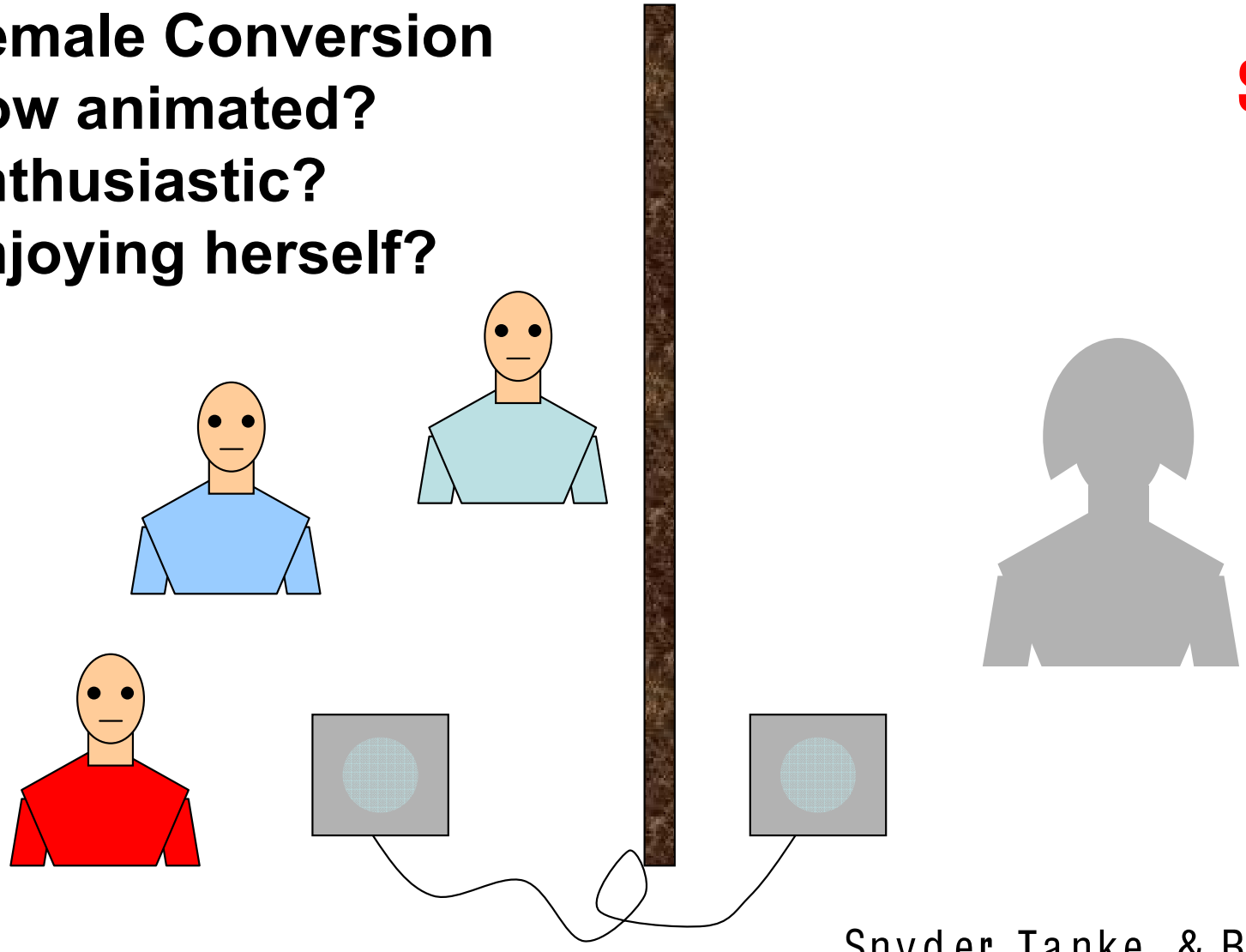
10 min conversation impression

Snyder, Tanke, & Bersheid (1977)

Beauty in the *ear* of the beholder?

Female Conversion
how animated?
enthusiastic?
enjoying herself?

Step 2

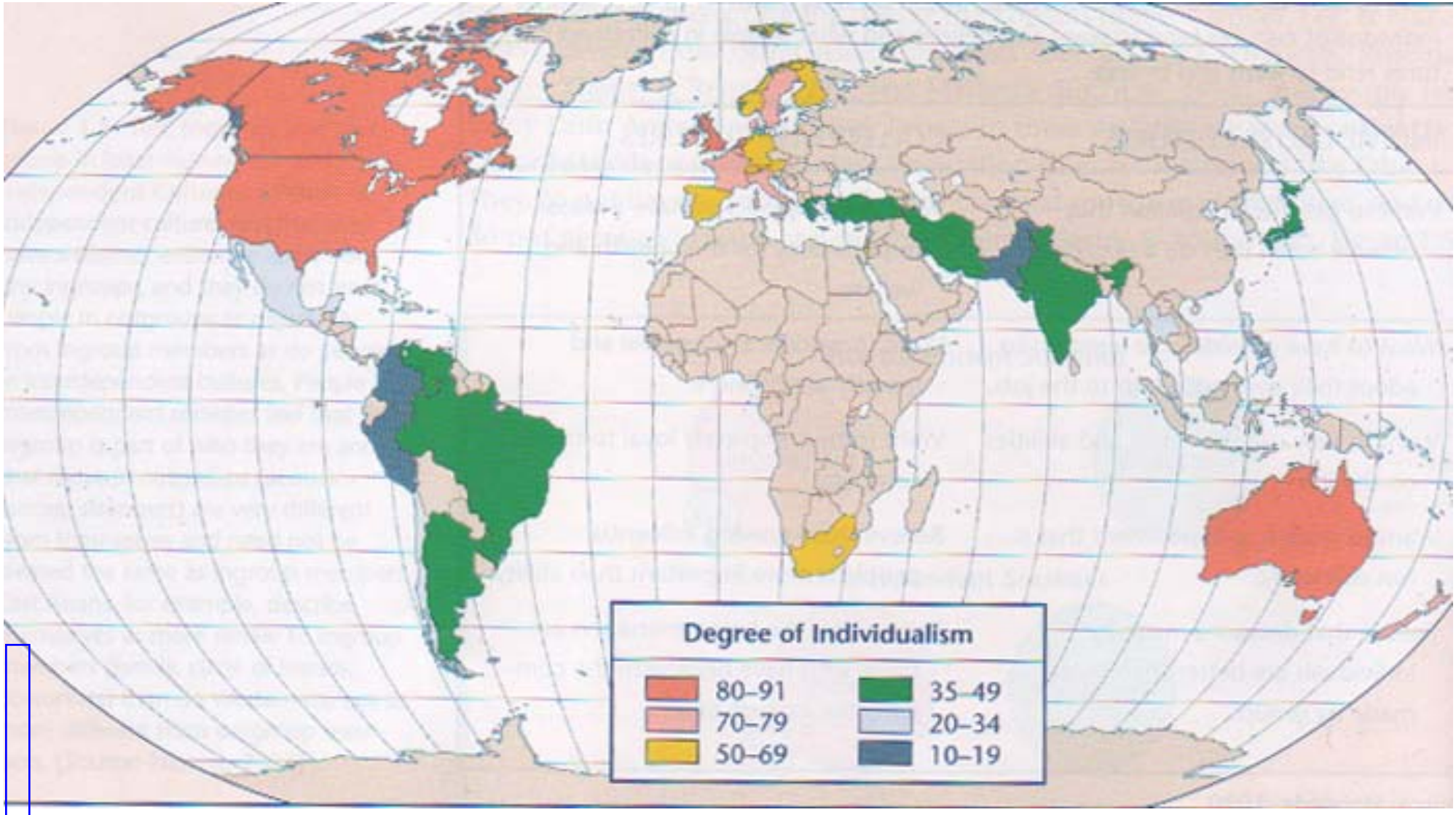


Snyder, Tanke, & Bersheid (1977)

Beauty in the *ear* of the beholder?

- **In the "attractive" condition, women were seen as more sociable, poised, humorous, socially adept**
- **Participants changed their partner's behavior with their expectations – what had been only a reality in the minds of the men became a reality in the behavior of the women they interacted with**
- **Participants then formed an impression of the women based on that (changed) behavior**

Snyder, Tanke, & Bersheid, (1977)

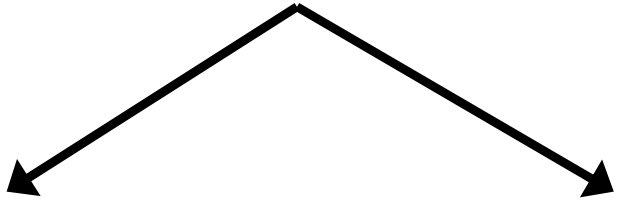


WEIRD societies – Western, educated, industrialized, rich, and democratic

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Models of Self

Communities' ideas about being a person and the social practices, situations, and institutions of everyday life that represent and foster these ideas.



Independent Models

- A person is fundamentally separate from others, stable, and consistent.
- Actions are under personal control and guided by preferences and needs.
- Gives priority to personal needs over group goals.
- Stands out, is unique, expresses the self
- Values feeling good about oneself and high arousal, excitement

Interdependent Models

- A person is fundamentally connected to others.
- Actions are primarily guided by social norms and roles.
- Subordinates personal needs and beliefs to maintain group harmony.
- Meets obligations, expectations, norms, fits in
- Values self-reflection, self-criticism and low arousal, calm

Relative vs. Absolute Size

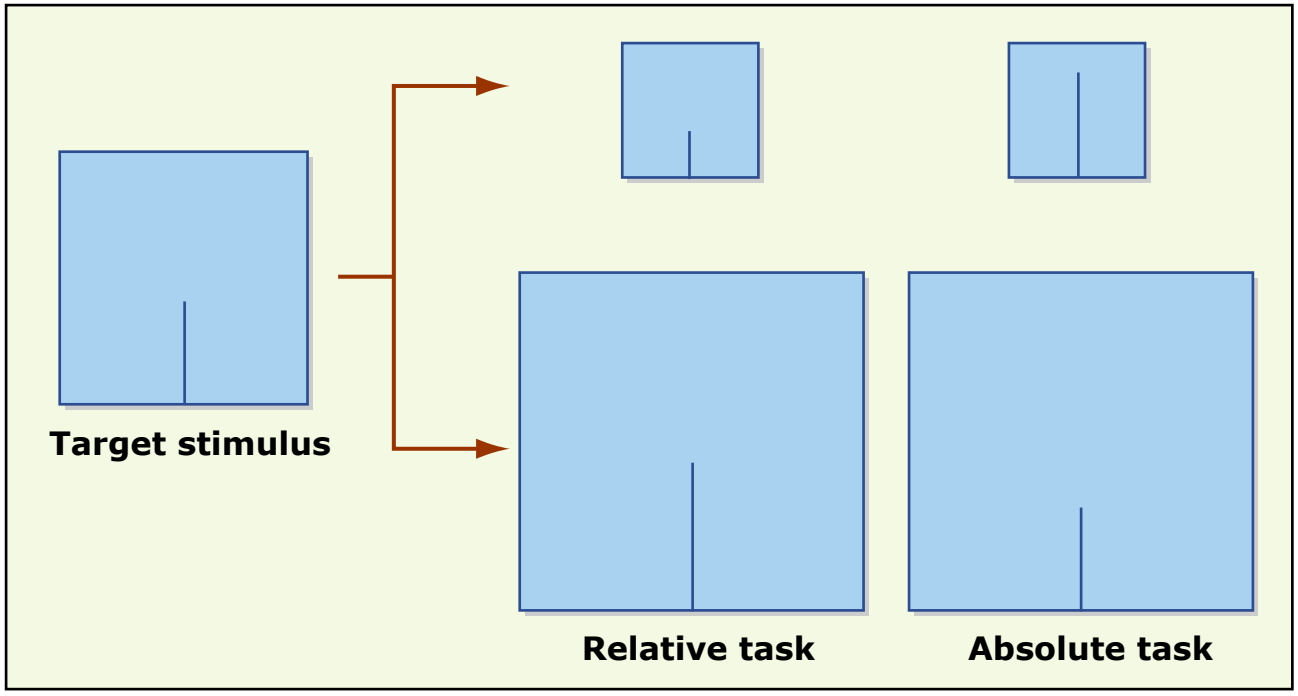


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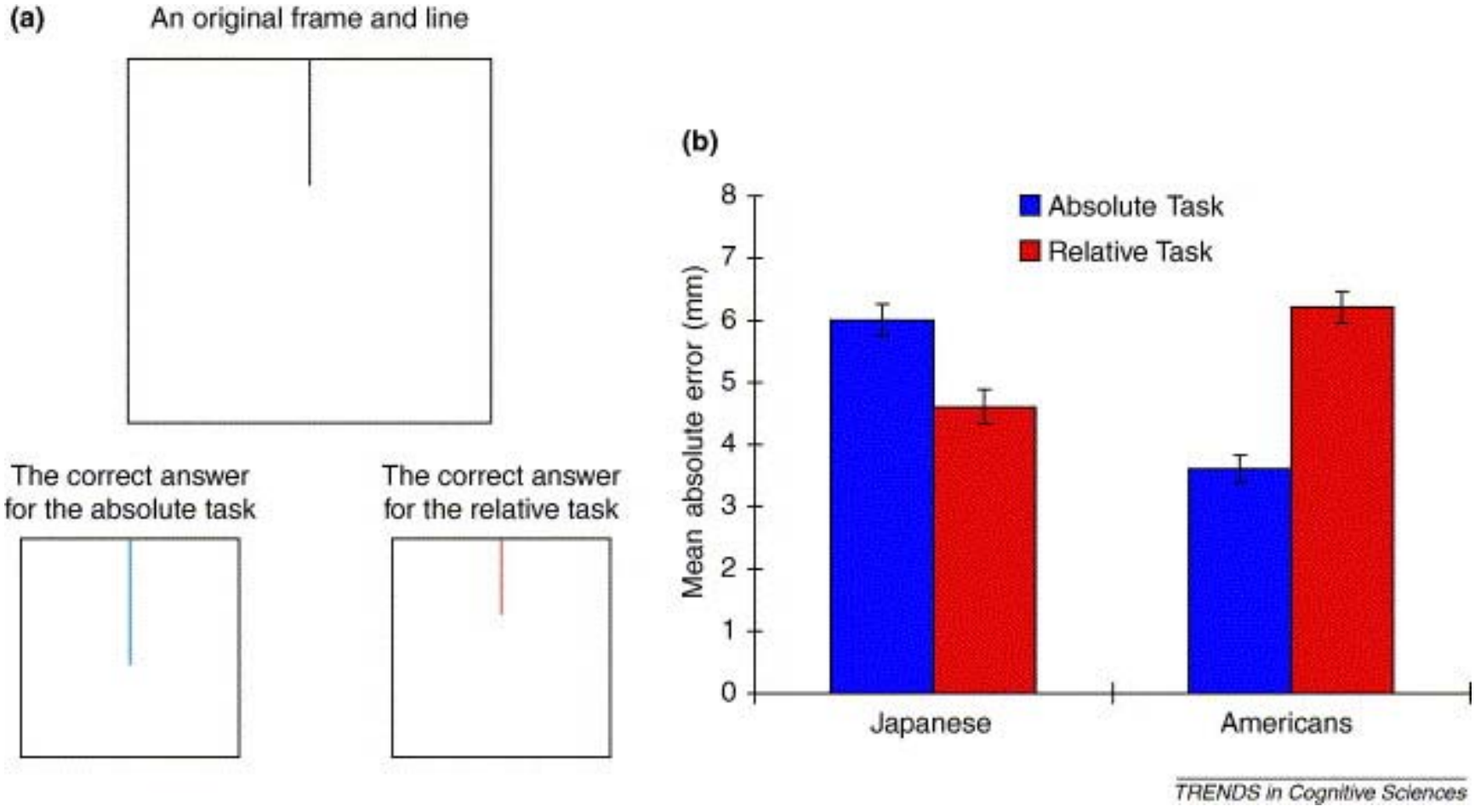
Look at target stimulus - taken away - see new empty Box, draw line of either equal *relative size* or *absolute Size*

Japanese subjects more accurate for *relative size*

American subjects more accurate for *absolute size*

How malleable?

Figure 2. Framed-Line Test



(a) Participants were shown a square frame with a vertical line like the one at the top. They were then shown a new square frame of a different size and were asked to draw a line that was identical to the first line in either absolute length (absolute task), like the blue line at the bottom left, or in proportion to the surrounding frame (relative task), like the red line at the bottom right.

(b) The error scores show that American participants were more accurate in the absolute task than the relative task, whereas Japanese were more accurate in the relative task, suggesting that Japanese were paying more attention to the frame than Americans were.

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Nisbett & Miyamoto, Trends in Cog Sci, 2005

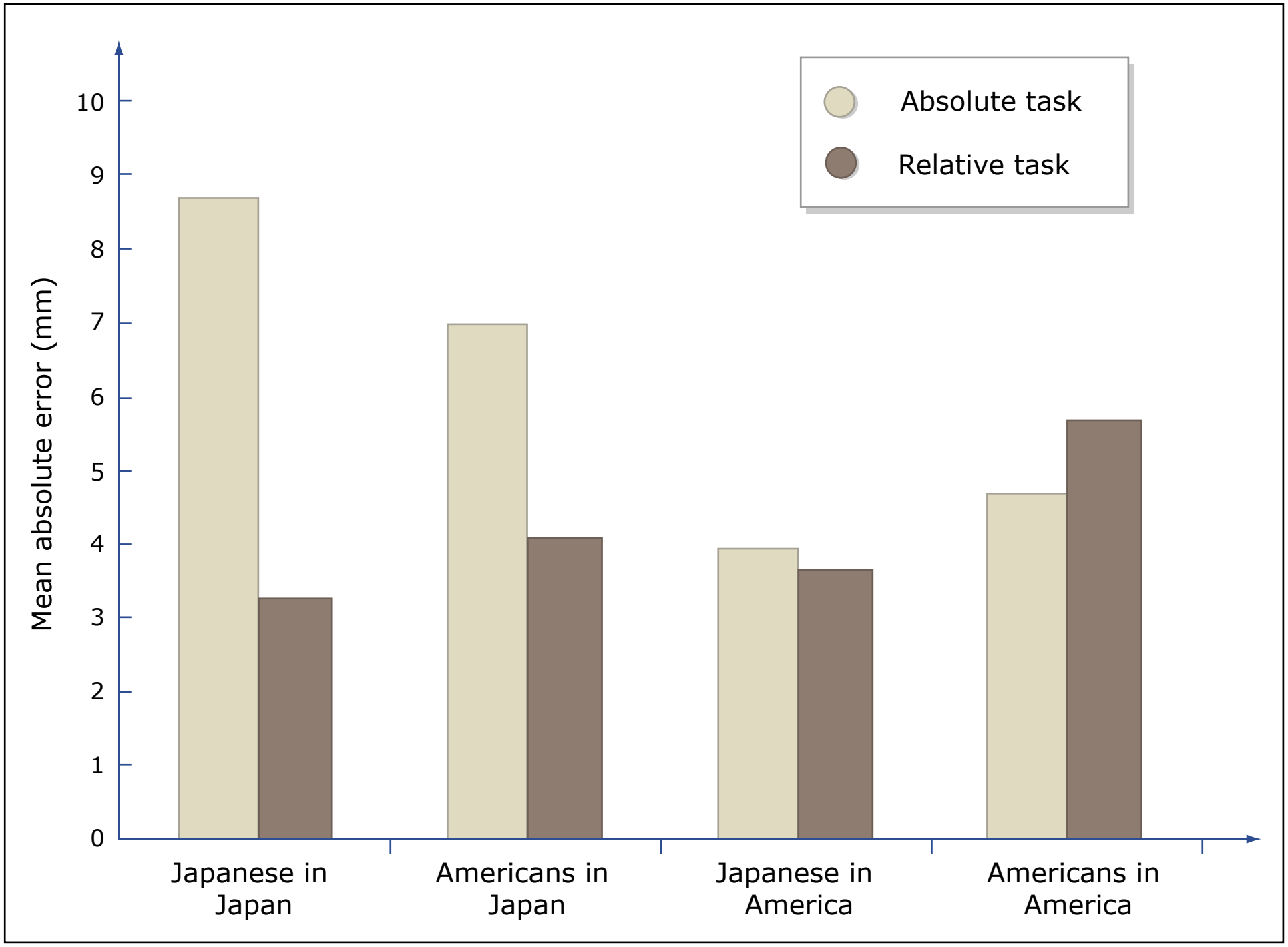
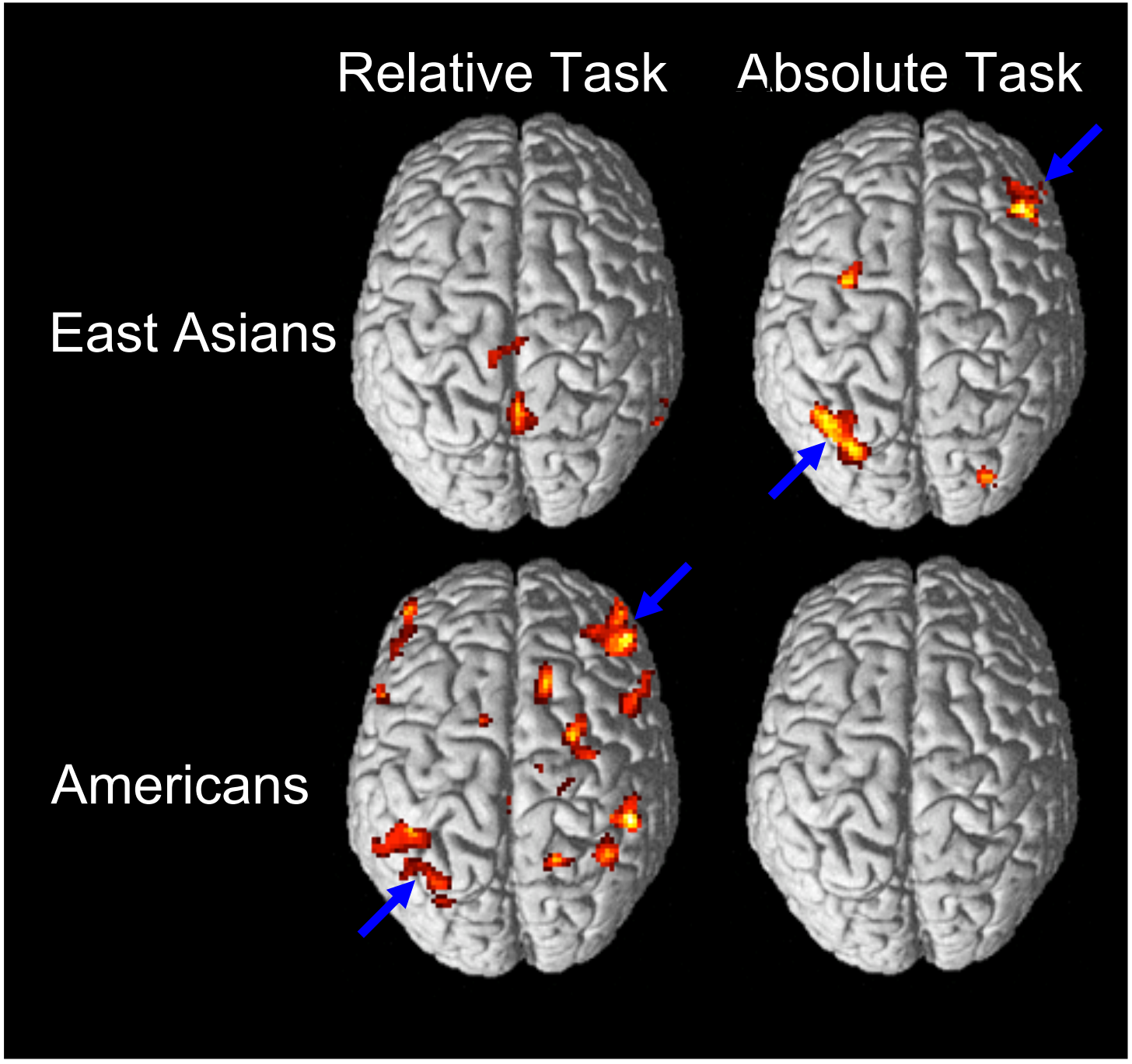


Image by MIT OpenCourseWare. Adapted from Kitayama, S., et al. "Perceiving an Object and its Context in Different Cultures." *Psychological Science* 14, no. 3 (2003): 201-6.

Greater Brain Activation to Support Culturally Non-Preferred Task



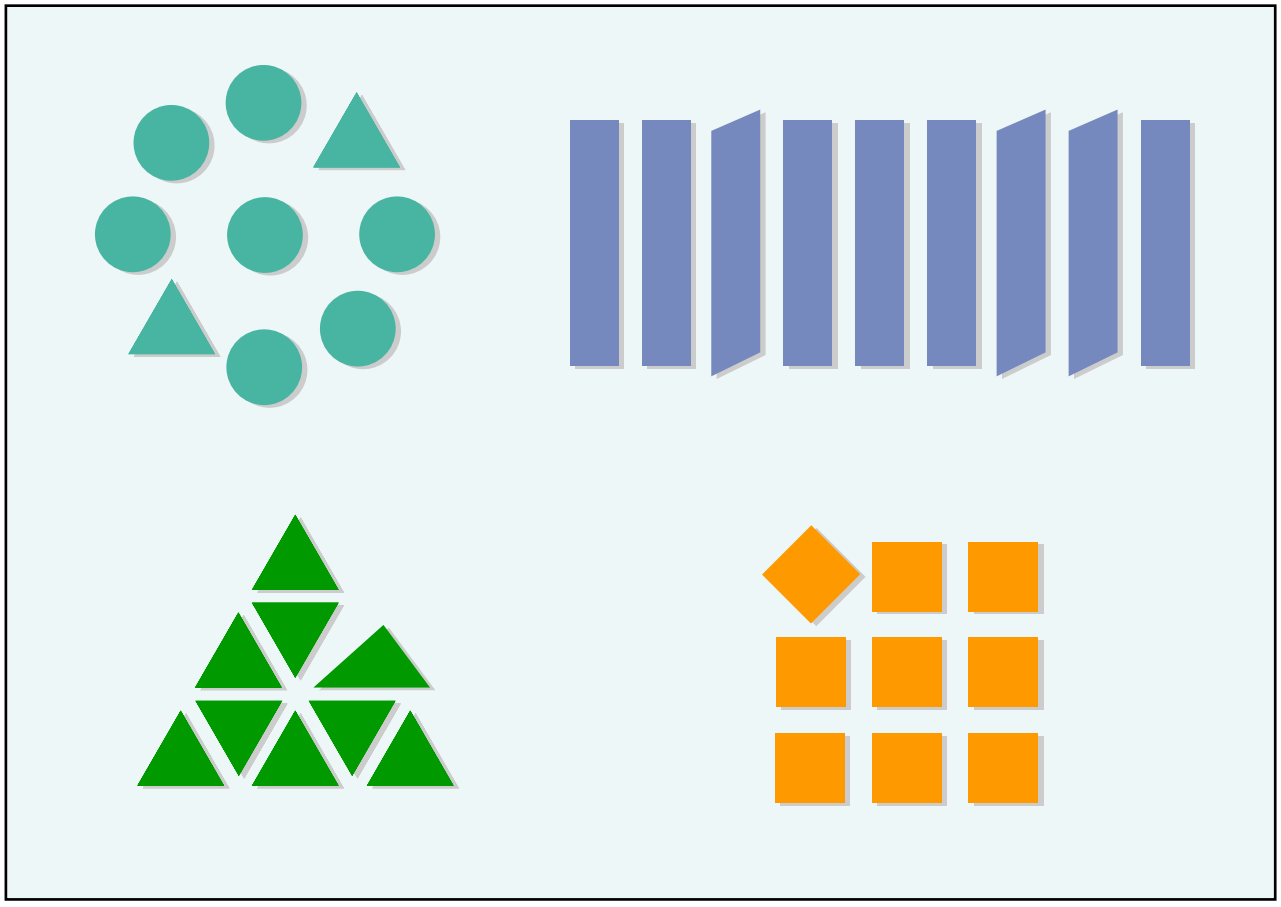
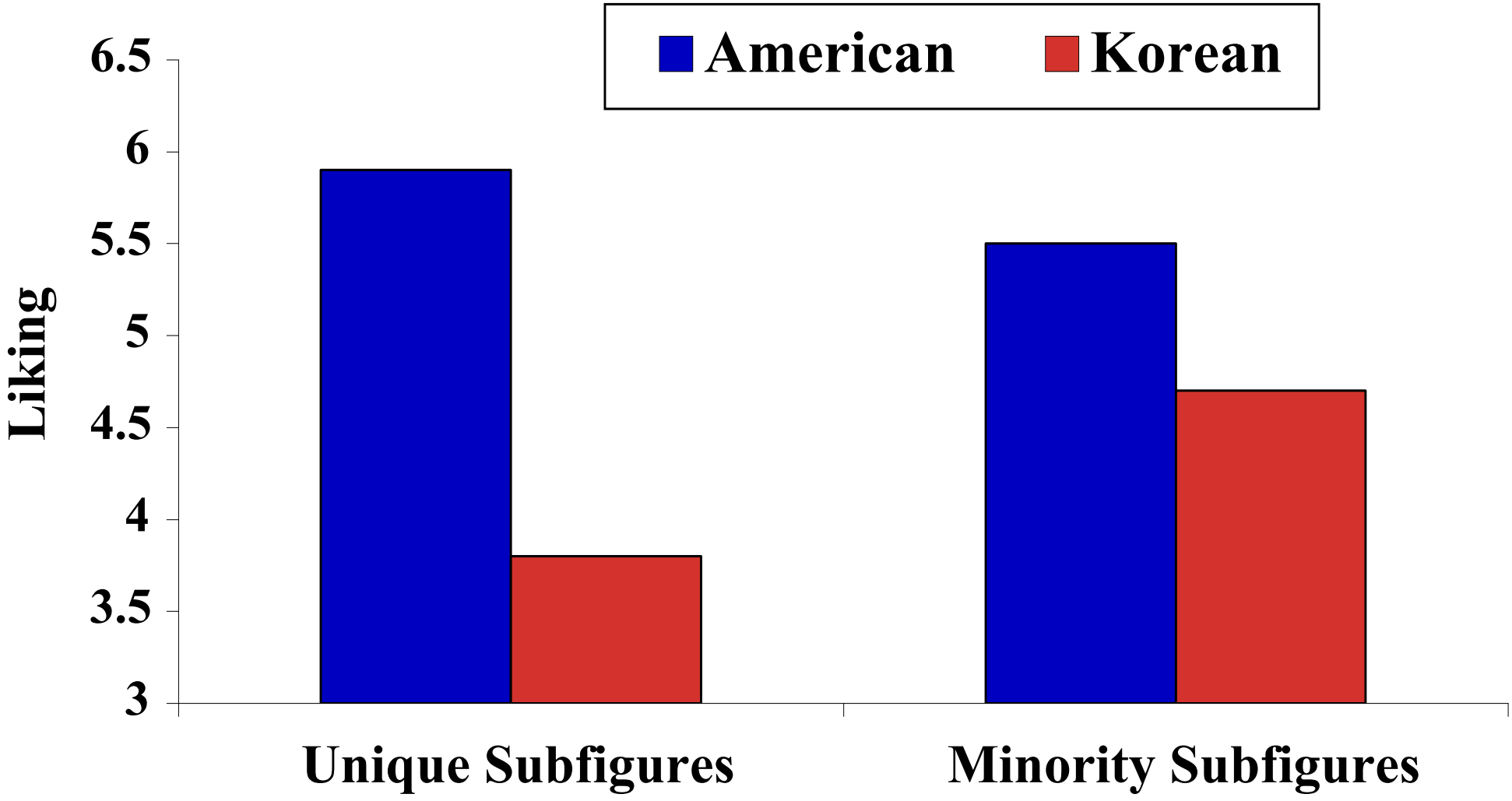


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Preference for Uniquenes
(Kim & Markus, 1999)



1+4 Condition

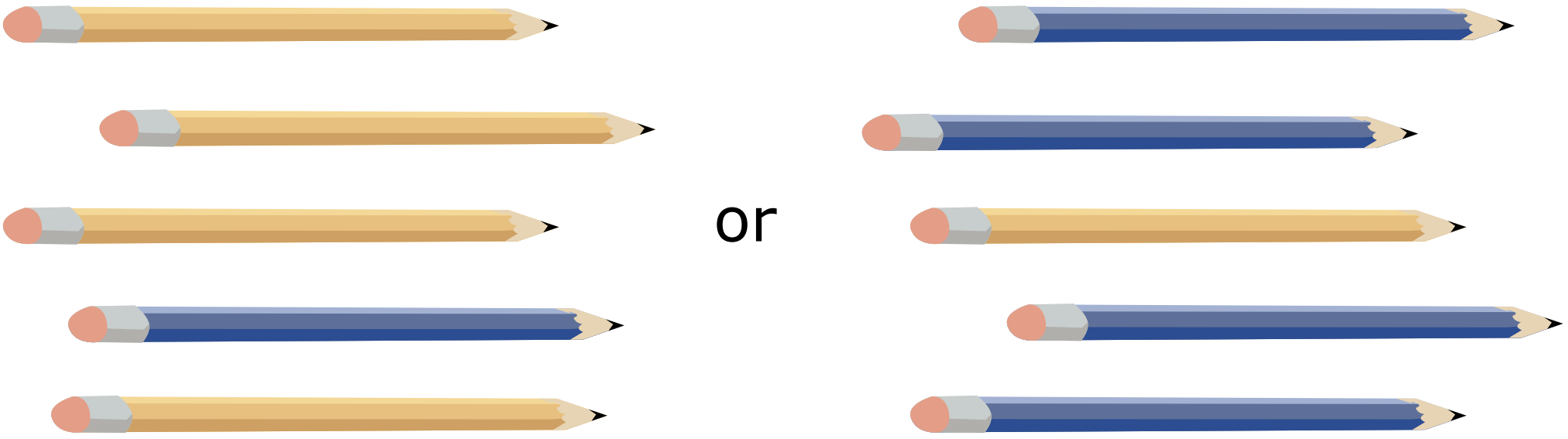


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2+3 Condition

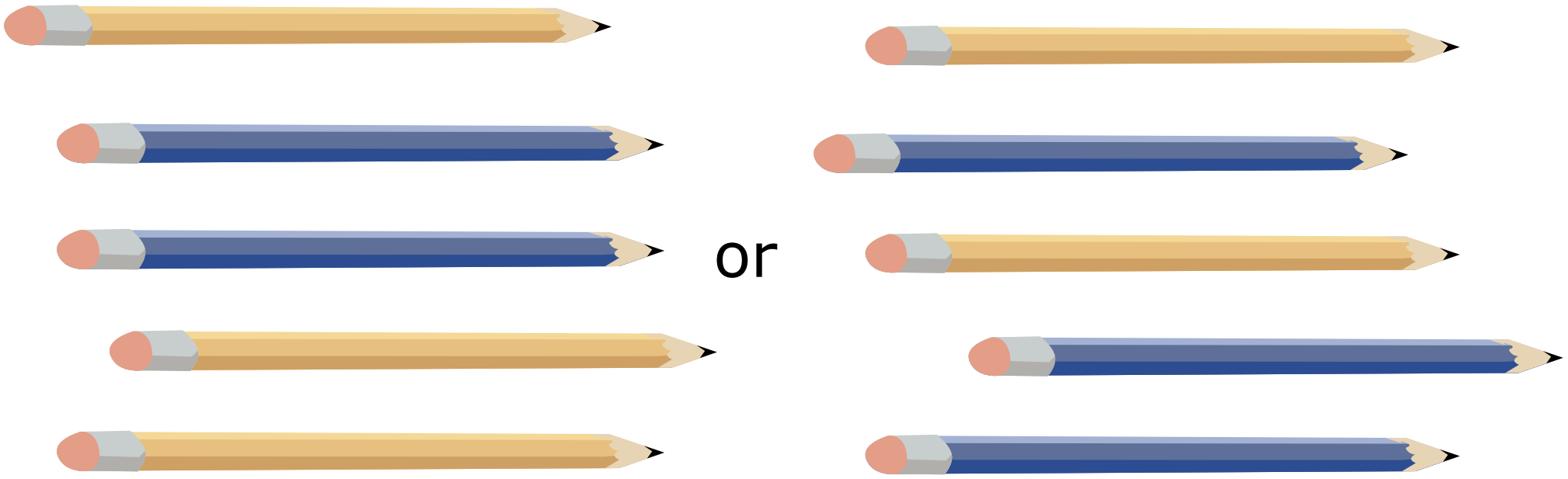
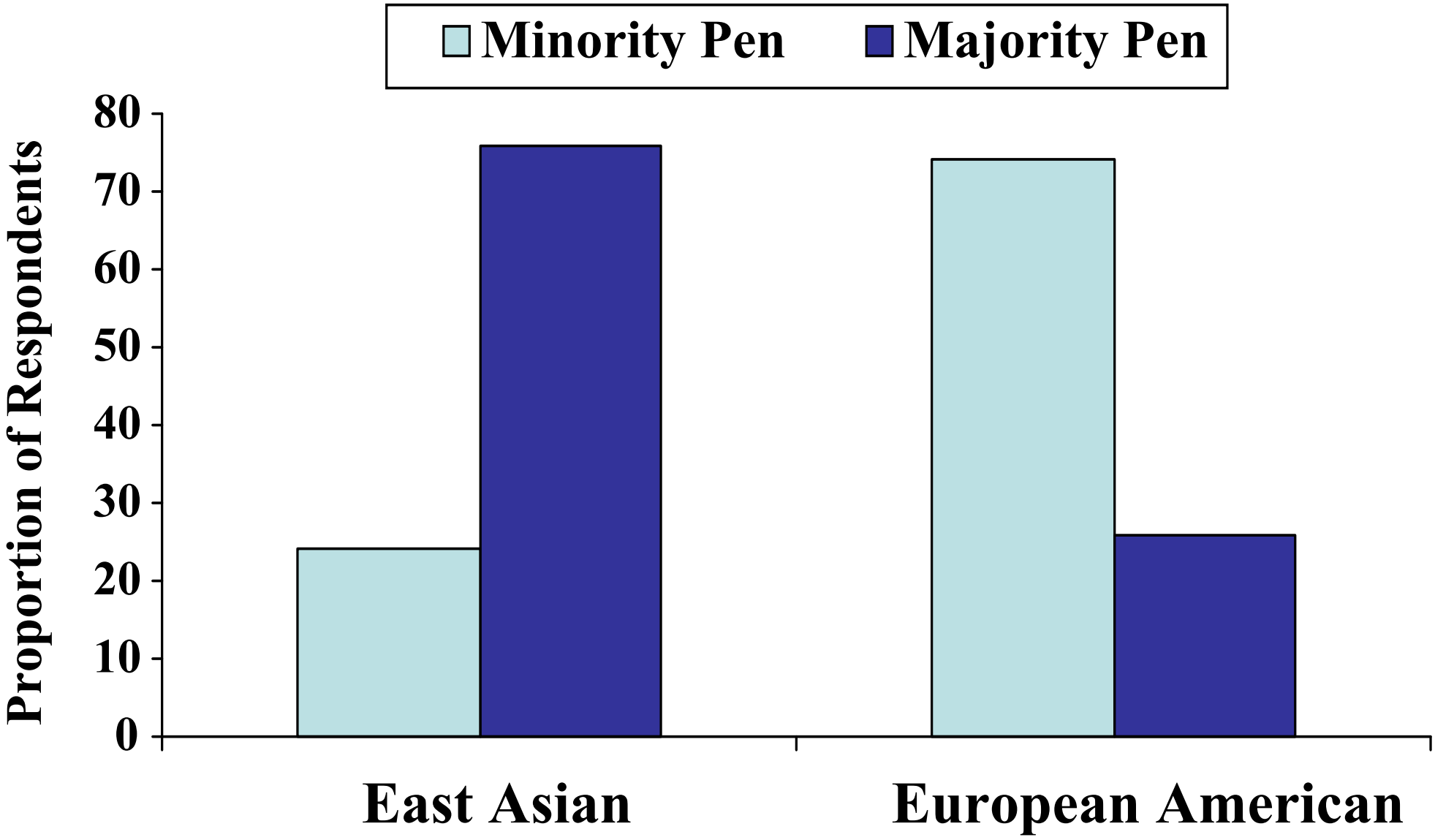


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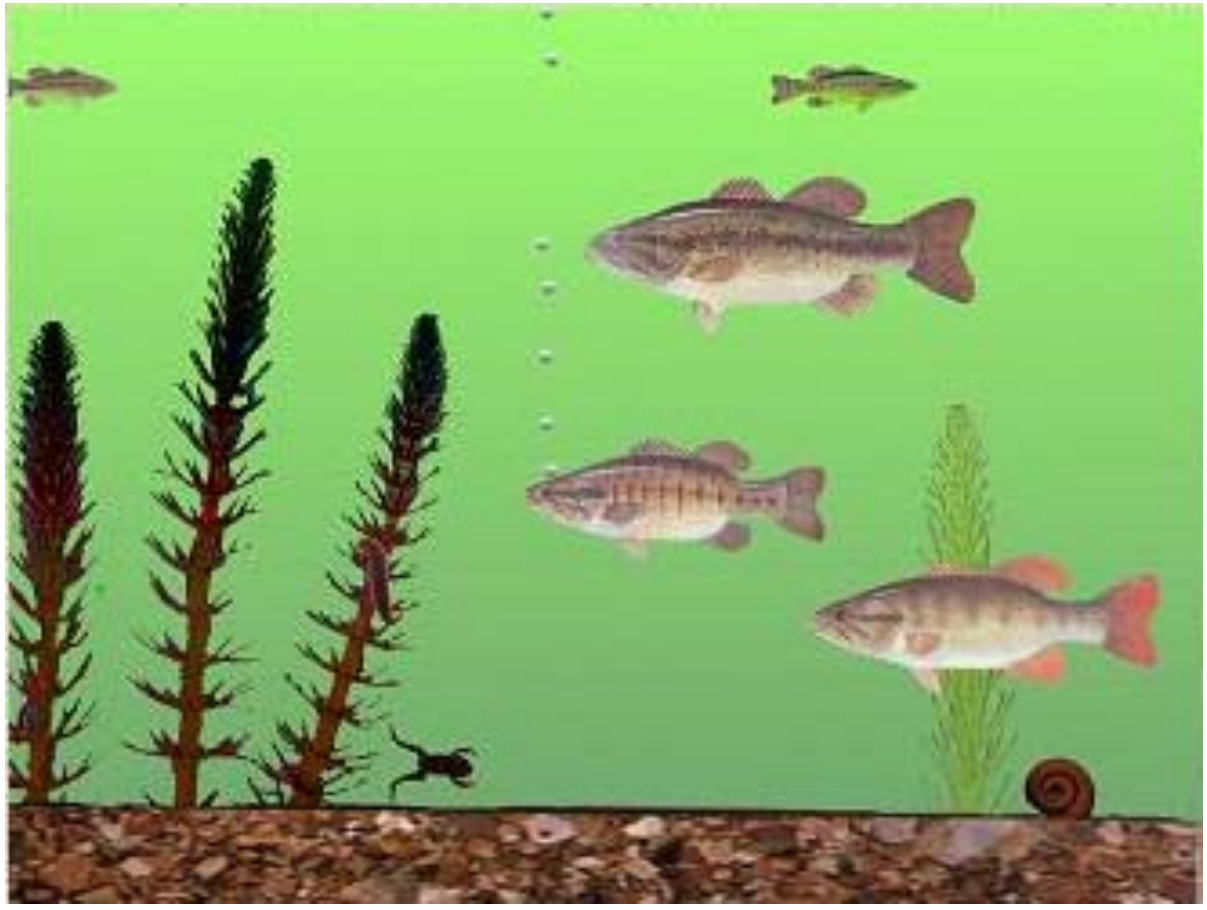
Unique Pen Choice: International Airport

(Kim & Markus, 1999) *



Culture and Attention : The Self-

The Michigan Fish Test

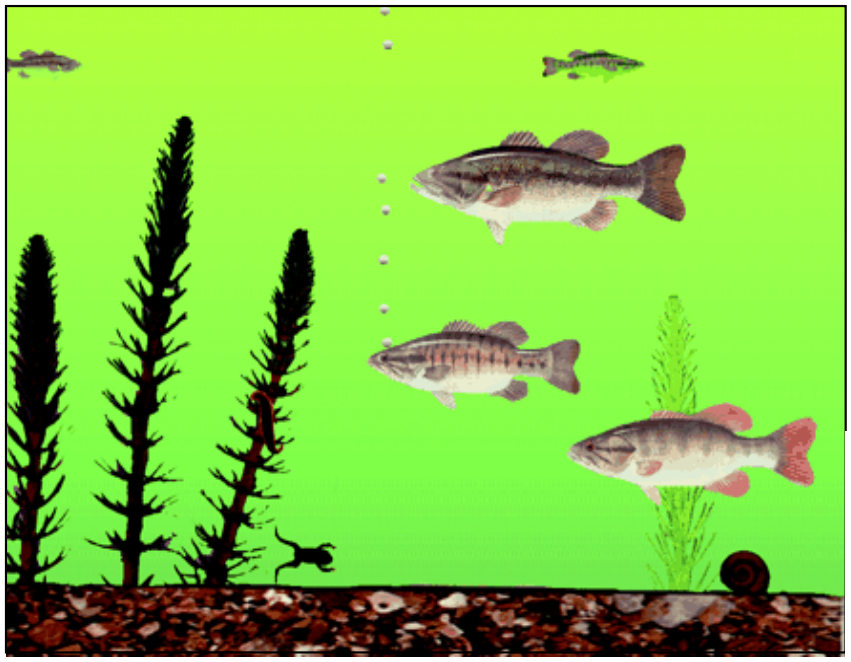


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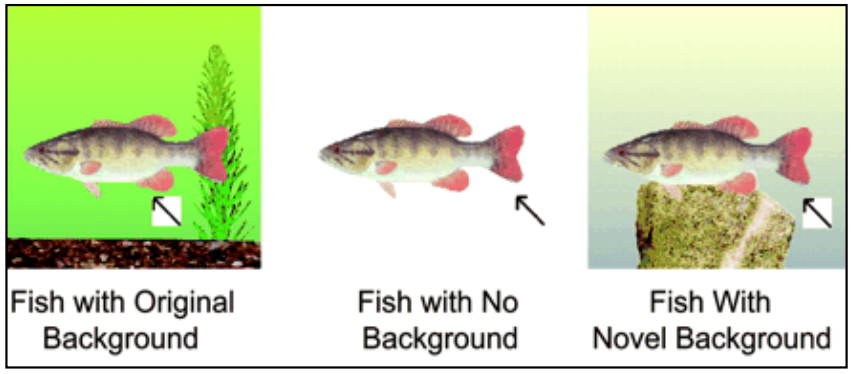
North Americans referred to the attributes of the target fish; the Japanese referred to the background and contextual information as well as the target fish attributes.

(Masuda & Nisbett, *Journal of Personality and Social Psychology*, 2001)

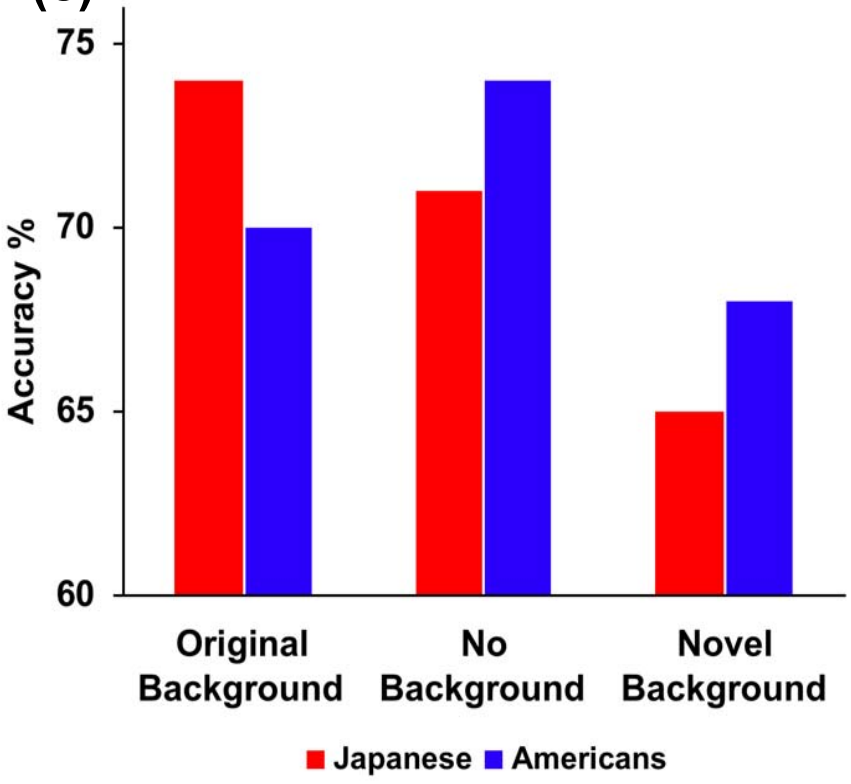
(a)



(b)



(c)



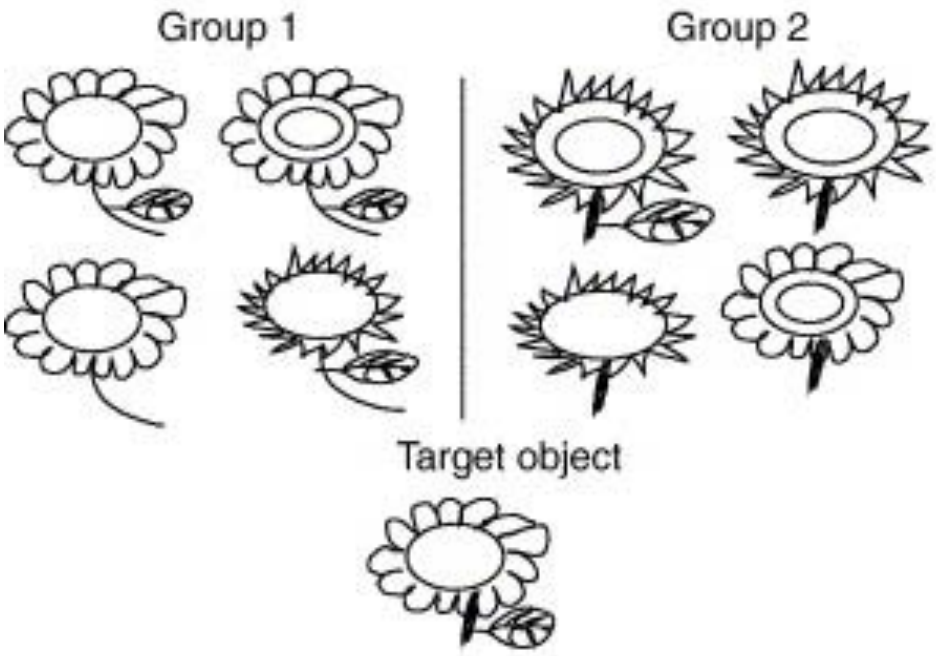
(a) Still photo from animated underwater vignette. **(b)** Focal fish previously seen viewed against previously seen background (*Left*), r background (*Center*), or novel background (*Right*). **(c)** Recognition accuracy for previously seen objects Accuracy rates of Japanese participants varied significantly as a function of background conditions.

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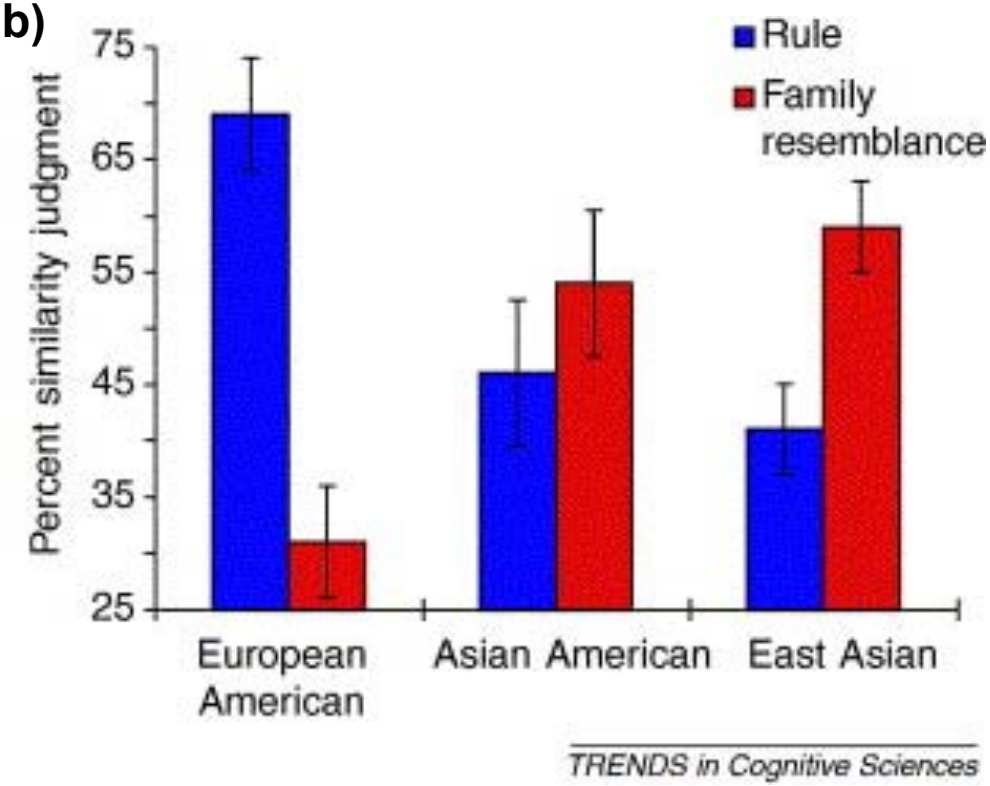
Masuda & Nisbett, J Pers Soc Psych, 2001

Figure 1. Categorization task

(a)



(b)



(a) Participants were presented with a target object and two groups of four objects, and were asked to judge which group the target object was most similar to. In this example, all the objects in group 2 share the same stem as the target object, whereas the members in group 1 share a large number of features with the target, although no one feature is shared by all the members. Thus, whereas the group 2 shares a unidimensional rule with the target, group 1 is holistically more similar to the target.

(b) European Americans much more often perceived similarities based on the unidimensional rule, but East Asians more frequently perceived similarities based on holistic judgments of family resemblance.

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Nisbett & Miyamoto, Trends in Cog Sci, 2005

Fundamental Attribution Error

- disposition (personality) vs. situation
- more emphasis on interpreting actions in terms of dispositions in US
- more emphasis on interpreting actions in terms of situation in India, China, Japan, Korea
- East Asians less susceptible to attractiveness bias than Westerners

AUTISM

- prevalence 1/110-140 – dramatic increase in recent years (awareness?)
- diagnosed by age 3
- 4 males/1 female
- social cognition different (impaired?)
- communication/language difficulty in many cases
- stereotyped, repetitive movements

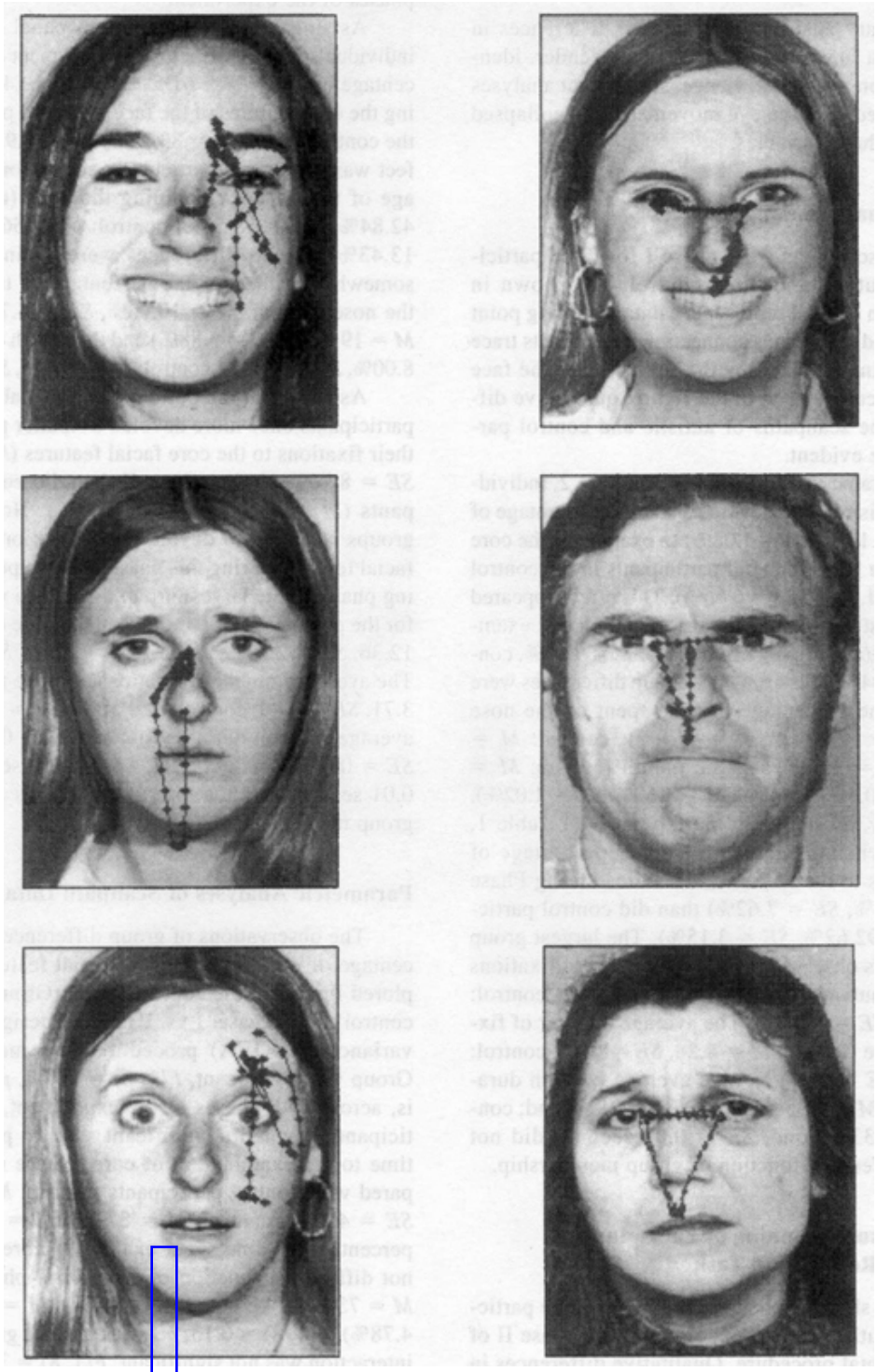


Fig 1. Sample scanpaths from phase I of the experiment. Participants were instructed to examine the faces in any manner they selected.

Source: Pelphrey, K., N. Sasson, et al. "Visual Scanning of Faces in Autism." *Journal of Autism and Developmental Disorders* 32, no. 4 (2002). © Springer. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

Pelphrey et al., J Autism & Dev Disord, 2002

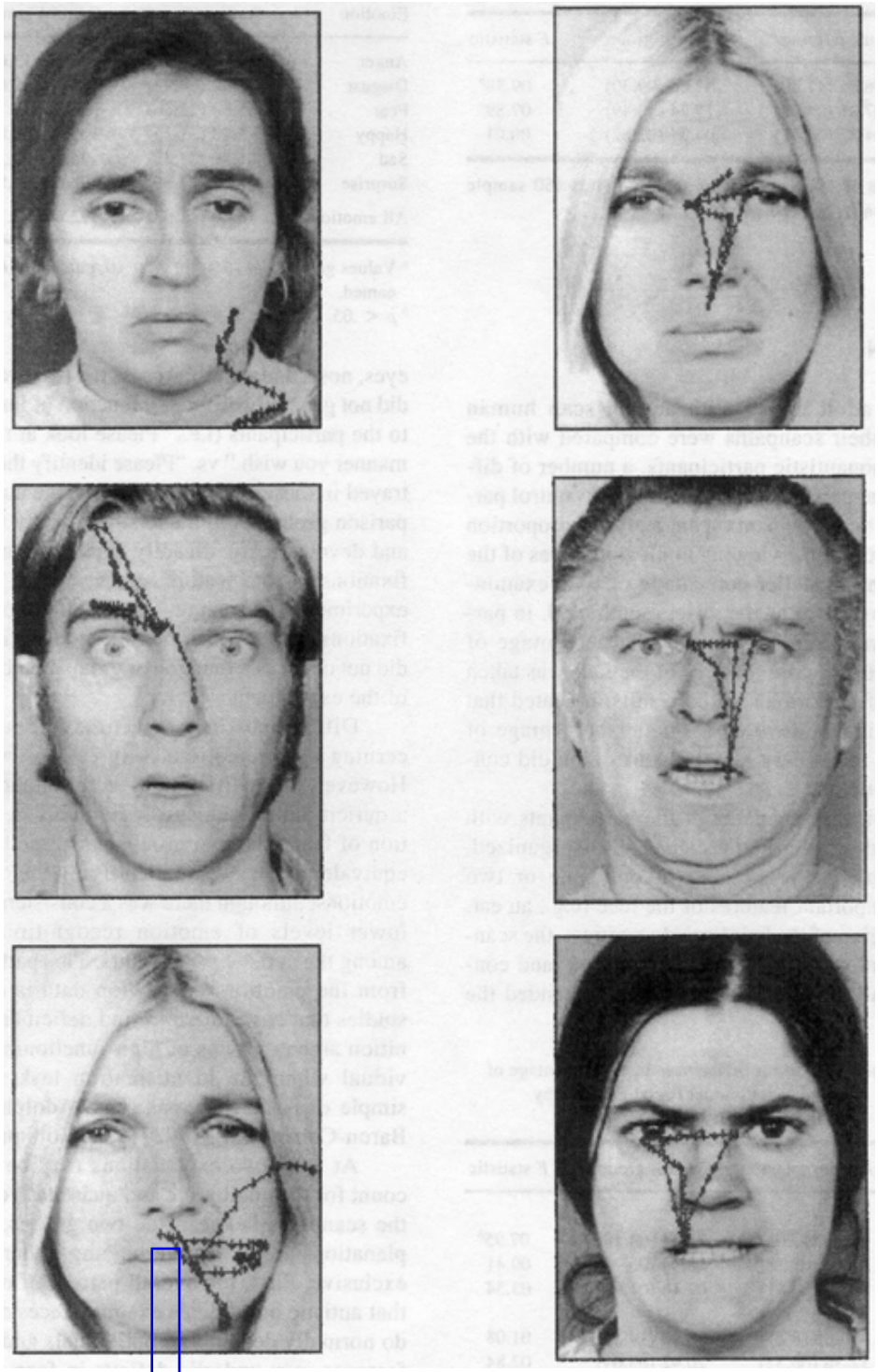
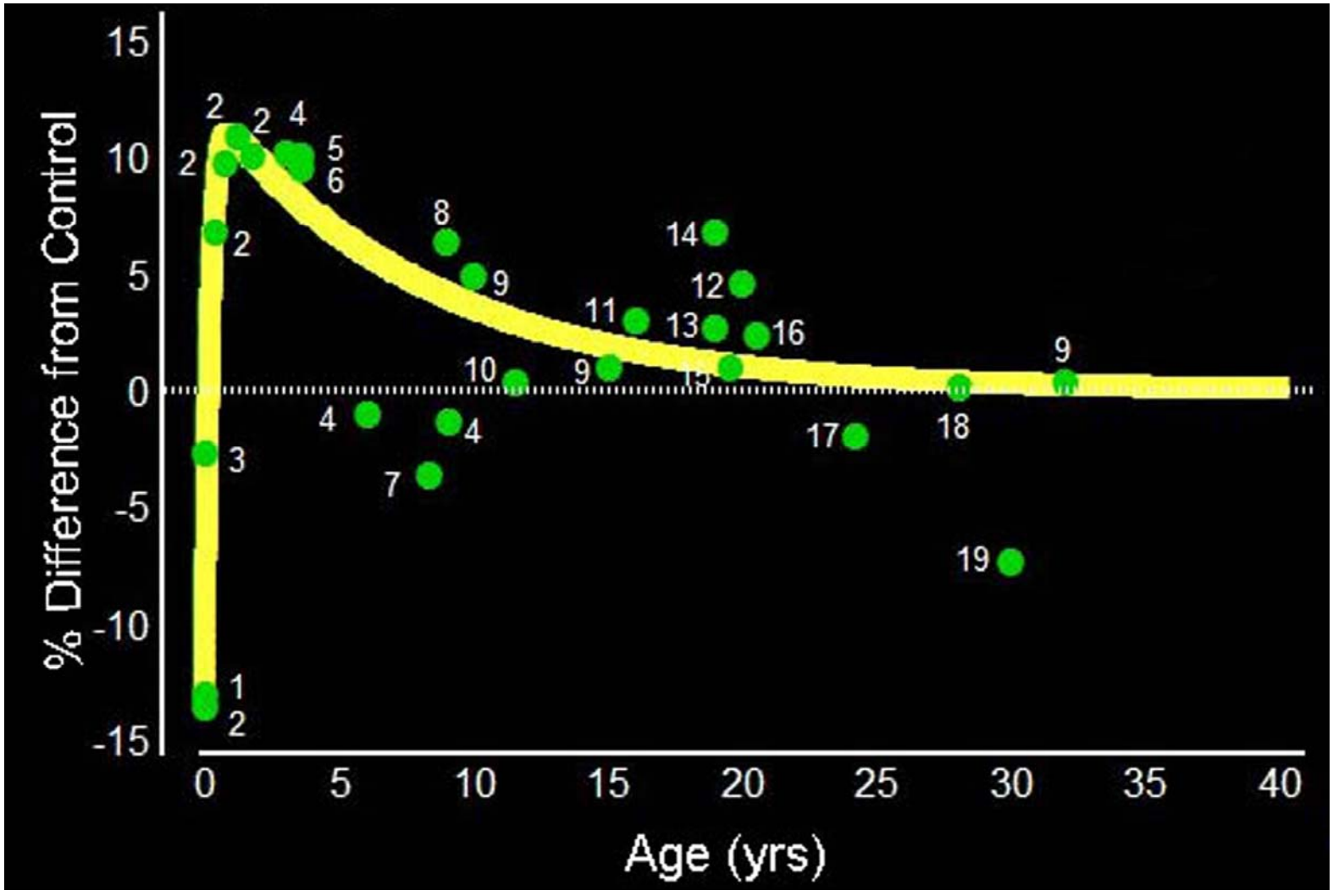


Fig 3. Sample scanpaths from phase II of the experiment. Participants were instructed to identify the emotion portrayed in each face.

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Pelphrey et al., J Autism & Dev Disord, 2002

Brain Size Differences are Maximal in First Few Years of Life in Autism



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Autism: Theory of Mind Deficit

- typical 4 year olds
- IQ matched 6-12 year olds with autism
- false picture control

(photo of object in a location, object moved, still in picture?)

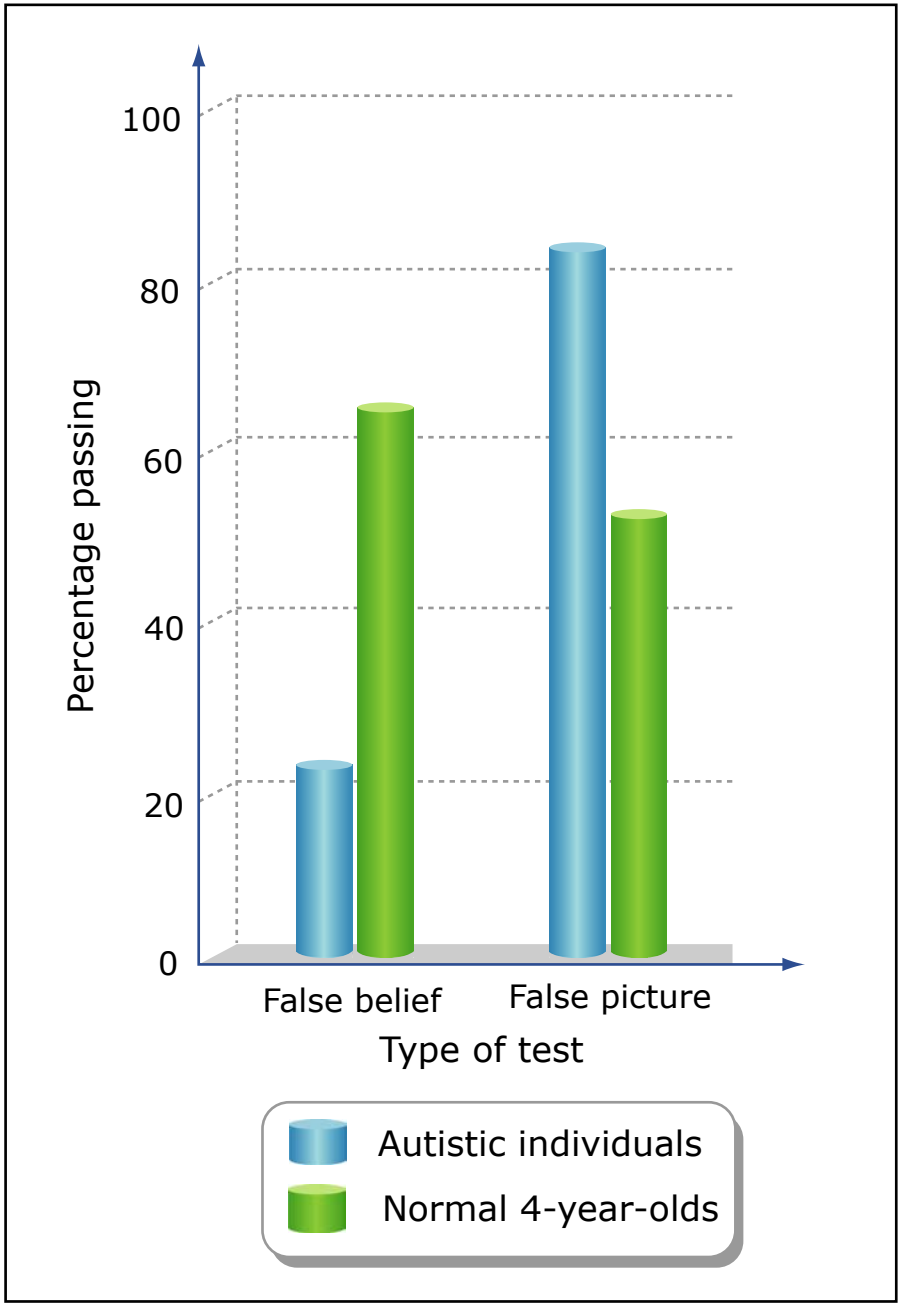
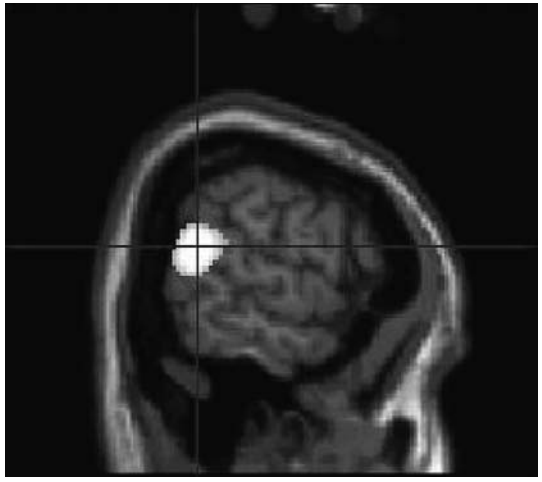
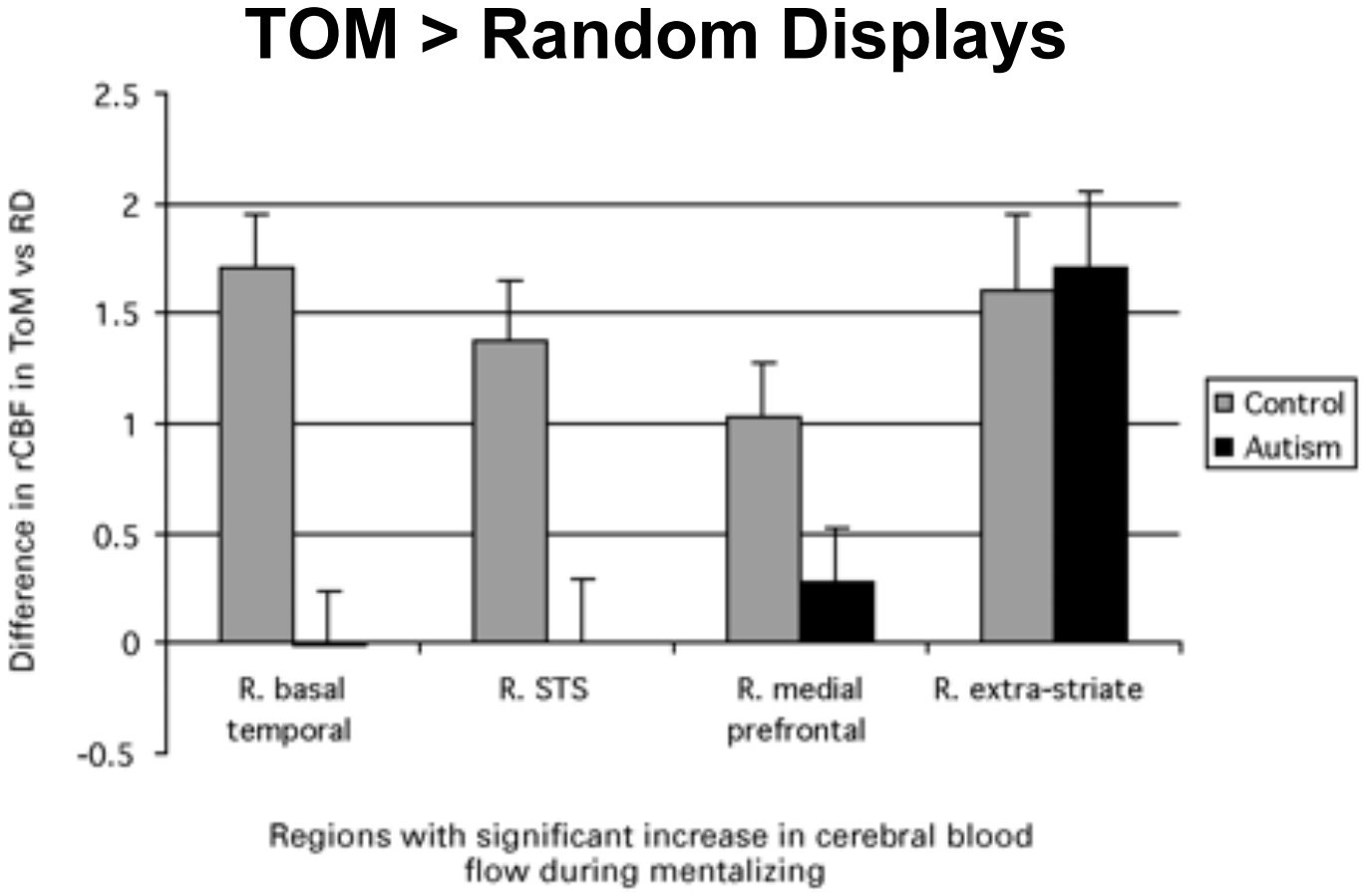


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Reduced social brain activation during theory of mind attribution in ASD



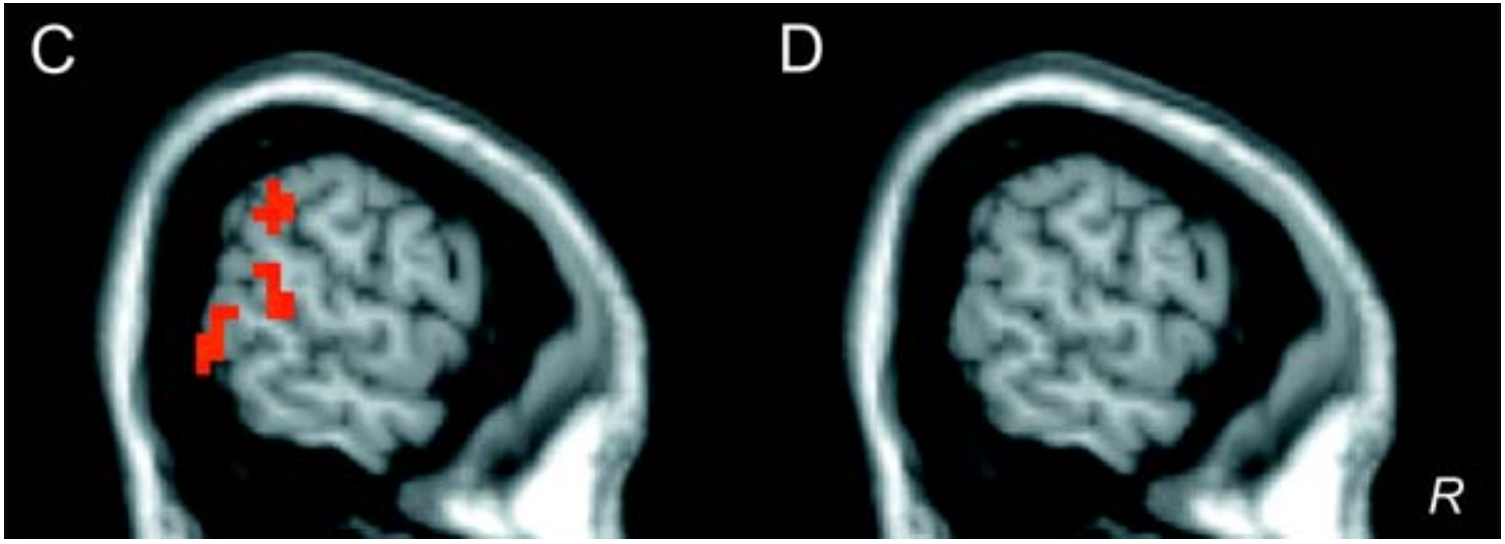


Source: Castelli, F., C. Frith, et al. "Autism, Asperger Syndrome and Brain Mechanisms for the Attribution of Mental States to Animated Shapes." *Brain* (2002). © Springer. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.



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INCONGRUENT > CONGRUENT



TYPICAL **AUTISM**

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9.00SC Introduction to Psychology
Fall 2011

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CONCLUSION

9.00

Introduction to Psychology

John Gabrieli

Exam 3 Preview

50 multiple-choice questions

30 from book (Chapters 8-13)

20 from Sacks & lectures (1 point)

5 short answers (4 pts)

Select 5 from 8-10 choices

70 points

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

- **brain**
- **perception**
- **cognition**
- **emotion**
- **personality**
- **development**
- **social interaction**
- **psychopathology**

CONCLUSION

- ***human nature***

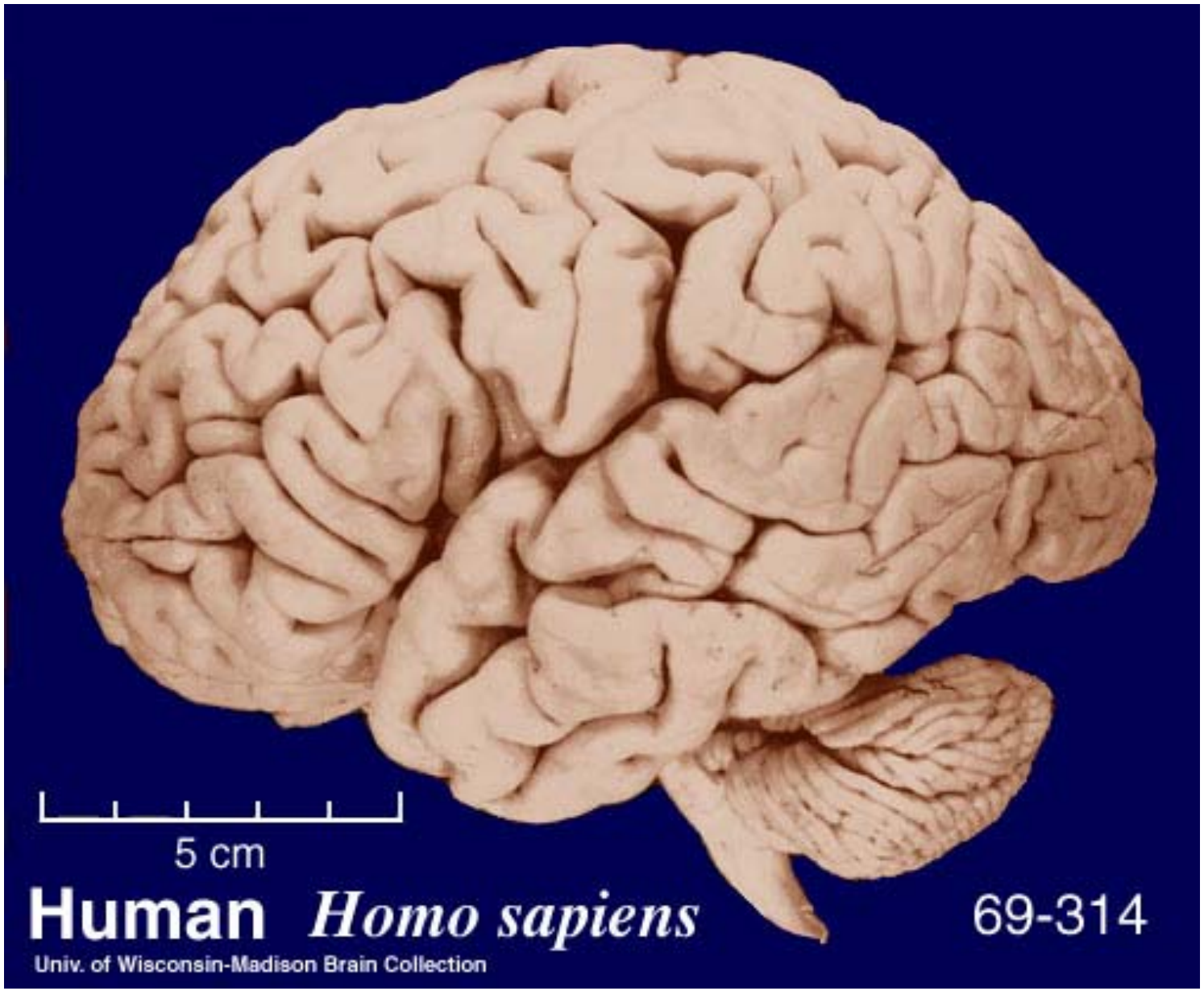
Why do we and others do what we do?

- evolutionary psychology

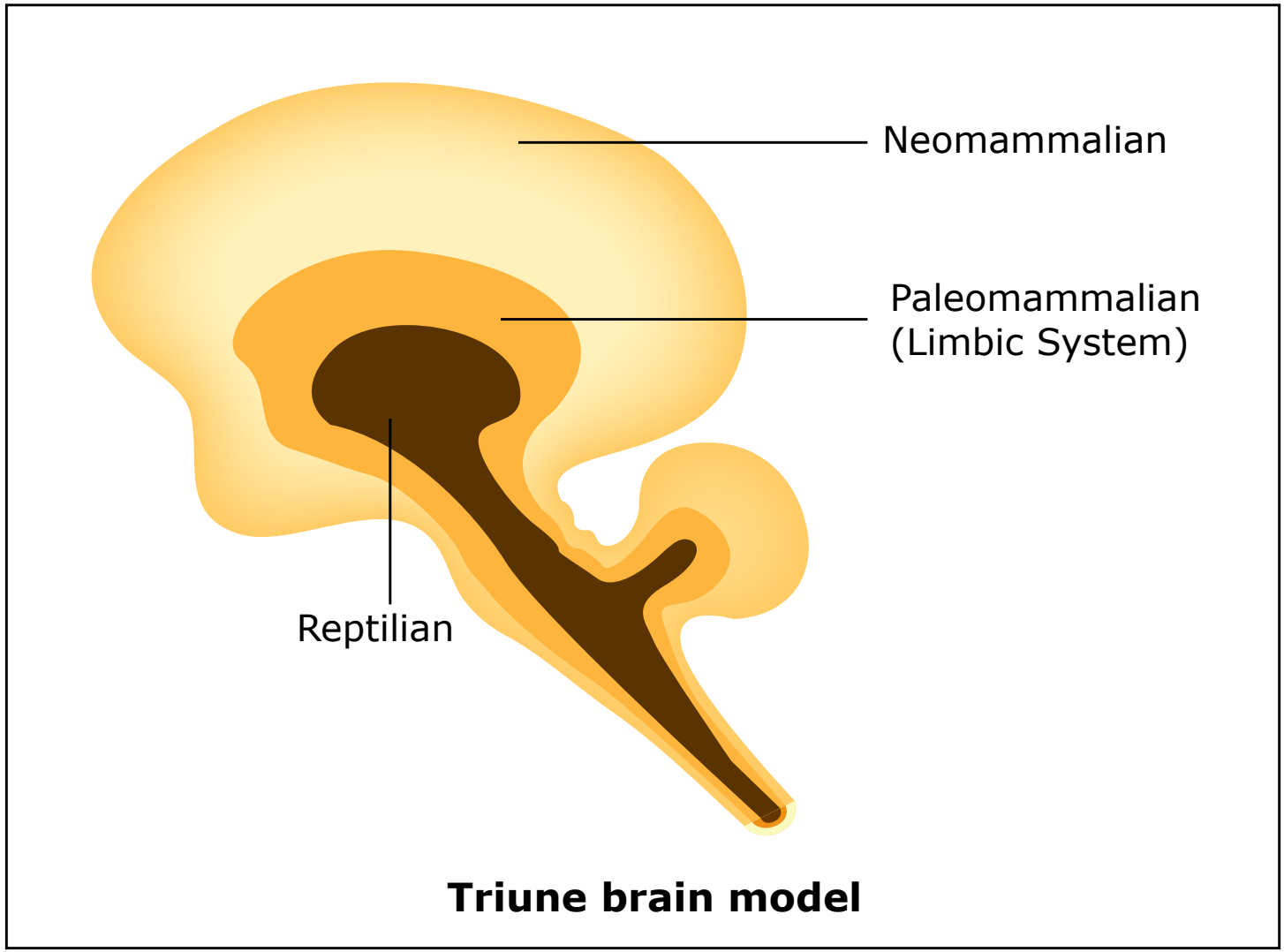
- ***how to live our lives***

- happiness

Fragile Power of the Human Brain



Reproduced (or adapted) with permission from http://www.brains.rad.msu.edu, and http://brainmuseum.org, supported by the US National Science Foundation.



Triune brain model

Image by MIT OpenCourseWare.

EVOLUTIONARY PSYCHOLOGY

- how our brains and minds evolved in nature - natural selection - survival of the fittest for passing genes into next generation
- attitudes toward race & sex (last election)
- different attitudes toward sex in men and women? different investments in procreation?

EVOLUTIONARY PSYCHOLOGY





Public domain (US government) photos.

- **sexism or racism worse problem?**
- **Implicit Association Test (IAT) – both remain a problem**
- **evolutionary psychologists – sexism more persistent because it is in our species; racism is culturally specific and more malleable**

EVOLUTIONARY PSYCHOLOGY

- **Williams syndrome**



Photo courtesy of Genetic Science Learning Center, University of Utah, http://learn.genetics.utah.edu.

- **rare neurodevelopmental disorder caused by a deletion of 26 genes from the long arm of chromosome 7**
- **distinctive "elfin" facial appearance, developmentally delayed language skills, unusually cheerful demeanor and ease with strangers, lack of fear/atypical amygdala function**
- **show sex IAT effect, but not race IAT effect**

Responders

	WOMEN	MEN
Date	50%	50%
Apartment	6%	69%
Sex	0%	75%

See Clark, R. D., III & E. Hatfield. “Gender Differences in Receptivity to Sexual Offers.” *Journal of Psychology and Human Sexuality* 2 (1989): 39-55. (PDF)

HAPPINESS

- **Aristotle - "The Objective of Life" - *"we chose it for itself, and never for any other reason"***
- **Jefferson - Declaration of Independence - *"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness."***

HAPPINESS

- what makes you HAPPY?

- what makes you UNHAPPY?

HAPPINESS

- what makes you HAPPY?

 health

 wealth

 new car, new plasma tv, new stuff

- what makes you UNHAPPY?

 broken wrist

 broken heart

HAPPINESS

- how do you measure happiness ?

Image removed due to copyright restrictions.

Subjective Happiness Scale self-assessment, from
Lyubomirsky, Sonjia. *The How of Happiness: A Scientific Approach to Getting the Life You Want*. Penguin, 2008. [Preview with Google Books]

Webform version of the assessment available at
http://chass.ucr.edu/faculty_book/lyubomirsky/discover_happiness.html

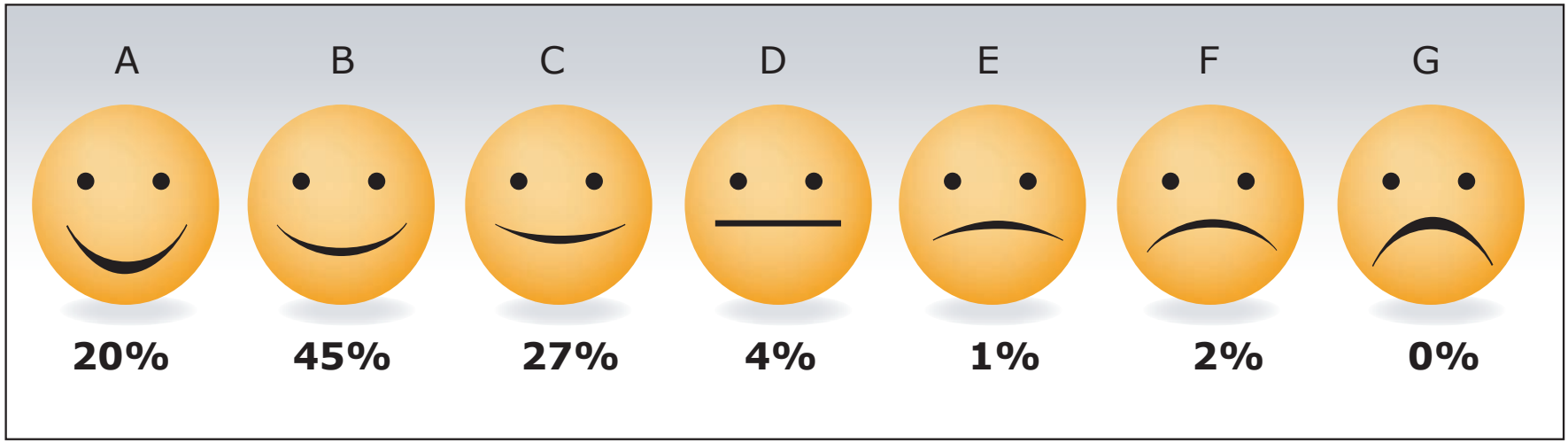


Image by MIT OpenCourseWare.

The happy man is not he who seems thus to others, but who seems thus to himself.
Publilius Syrus

HAPPINESS

- **Mostly “happy” (92%)**
- **Little influence of social status, income, gender, ethnicity**

HAPPINESS

- 7-point scale
- average 4.5/5.5
- college students - 4.9
- older - 5.6

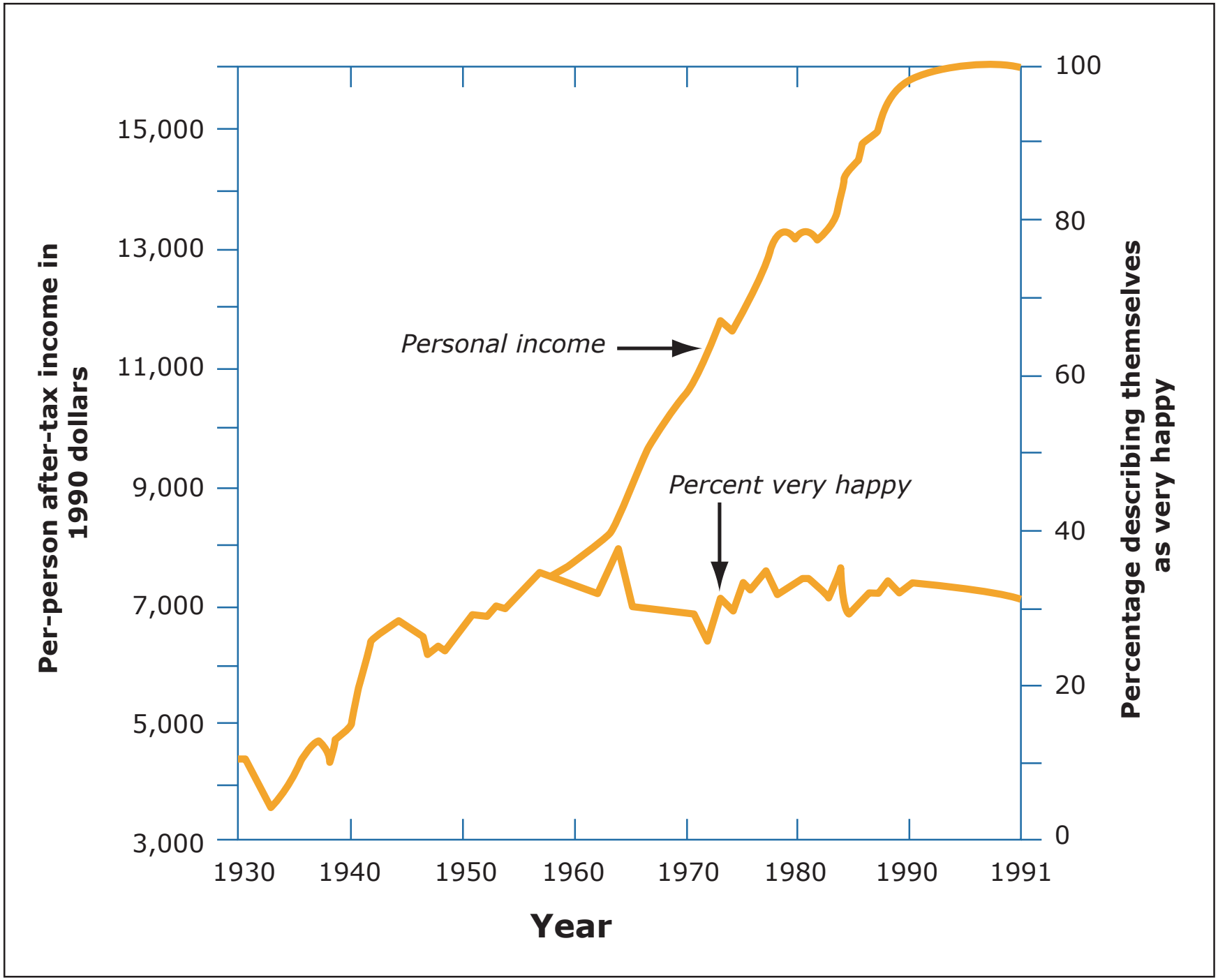
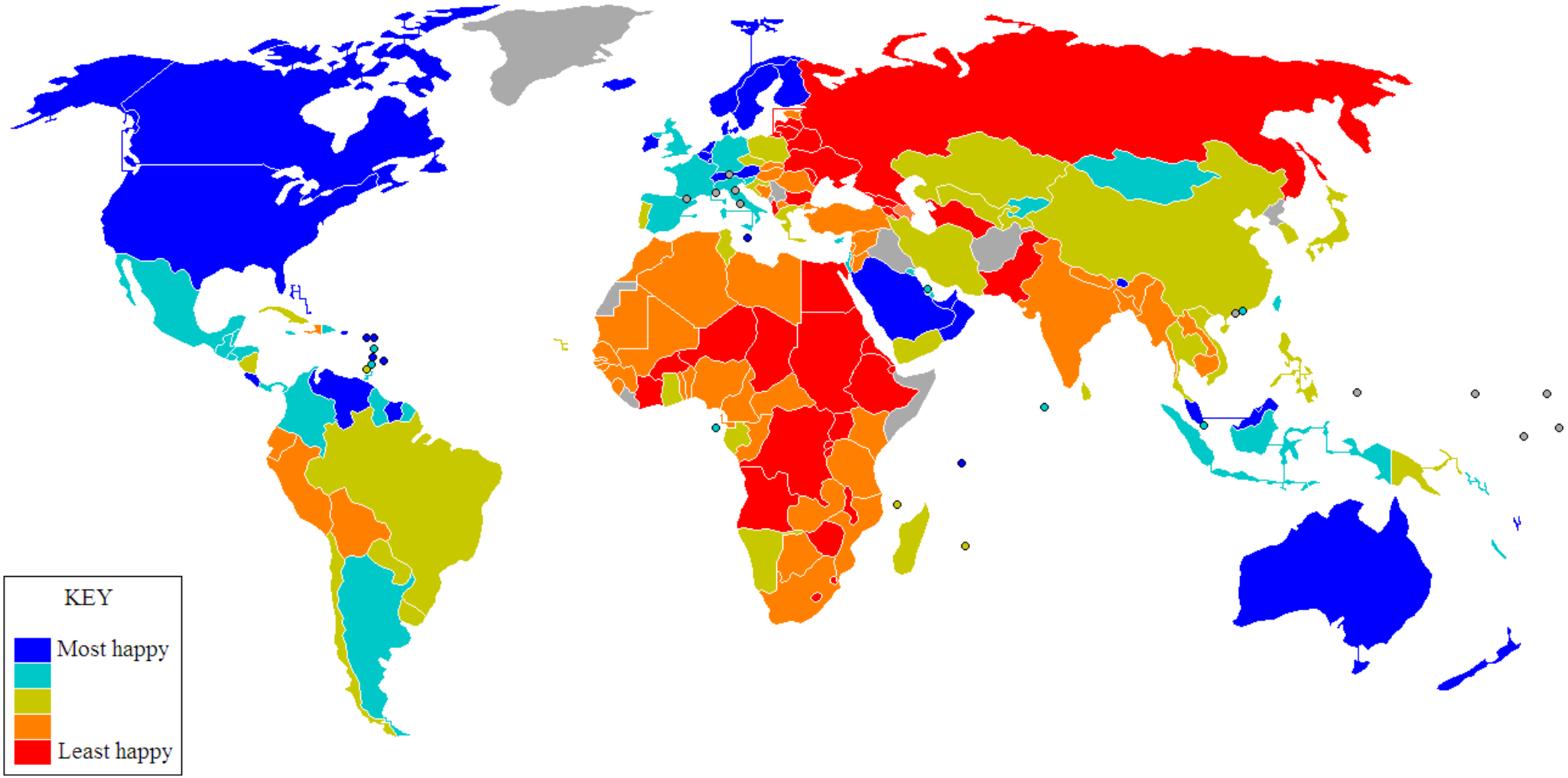
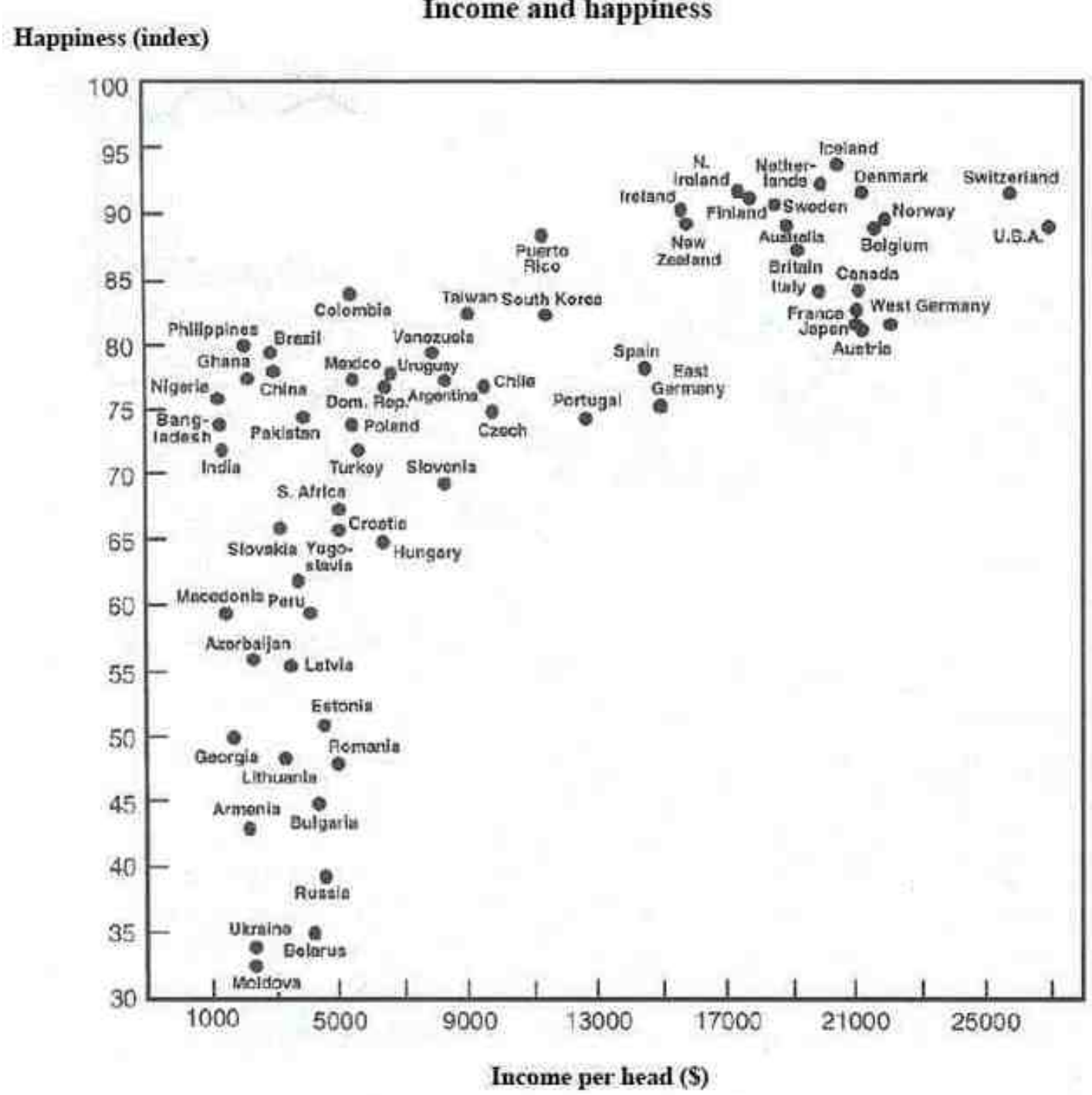


Image by MIT OpenCourseWare.



Satisfaction with Life Index

Public domain image, based on "The World Map of Happiness," by Adrian White, Analytic Social Psychologist, University of Leicester. See White, A. (2007). "A Global Projection of Subjective Well-being: A Challenge To Positive Psychology?" *Psychtalk* 56, 17-20.



Source: Inglehart and Klingemann (2000), Figure 7.2 and Table 7.1. Latest year (all in 1990s).

Source: Layard, Richard. "Happiness: Has Social Science A Clue?" Lionel Robbins Memorial Lectures 2002/3. Courtesy of Professor Richard Layard. Used with permission.

Measuring Satisfaction

A new study shows that people in wealthier countries are more likely to be satisfied with their lives. Earlier research had suggested that satisfaction did not necessarily increase once basic needs were met.



Source: Betsey Stevenson and Justin Wolfers, Wharton School at the University of Pennsylvania

THE NEW YORK TIMES

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Focusing Illusion

When thinking about one topic, greater importance is attributed to that topic

- **rate happiness, how many dates in last month? no correlation**
- **how many dates in last month, rate happiness? positive correlation**

Focusing Illusion

When thinking about one topic, greater importance is attributed to that topic

- **bad mood previous day, how much time people with various income levels are in a bad mood?**
 - **< $20K, 32% more time in bad mood than > $100K**
 - **actually 12%**
- **people making >$100K spend about 20% of time on passive leisure (socializing, tv; more enjoyable) vs. 34% for <$20K; more time on work, shopping, child care and obligatory tasks rated as more stressful**

Personality

GENETICS

Twin Studies

happiness (.50 - .80)

Set Point

Traits of happy people

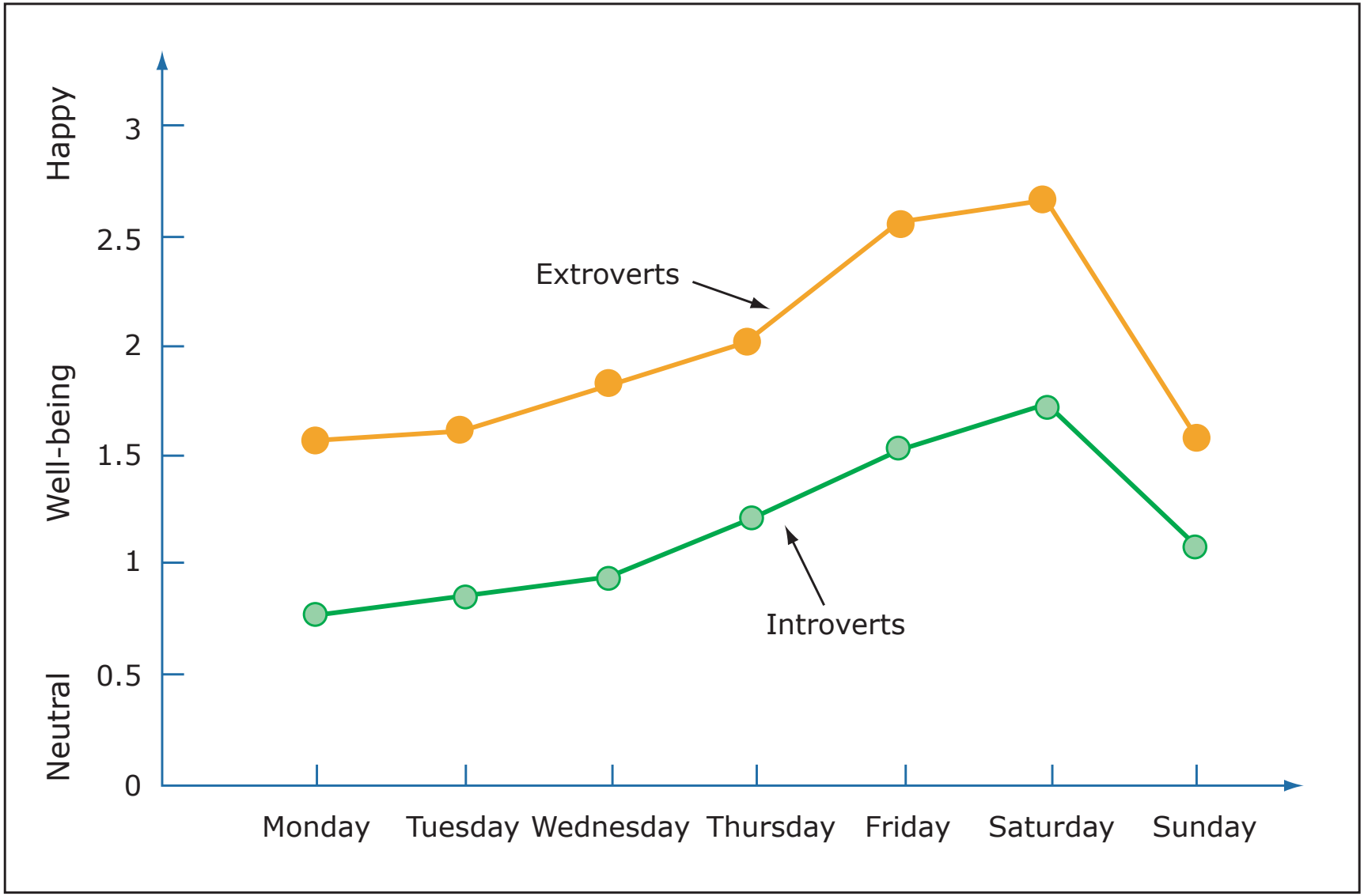


Image by MIT OpenCourseWare.

CAN PEOPLE BE TOO HAPPY?

- survey and longitudinal data
- highest levels of happiness

 most successful in close relations & volunteer work
- slightly lower levels of happiness

 most successful for income, education, & political participation

 what is "success"

Happiness

What makes us happy?

in the past

in the future

Happiness

- memory reconstruction
 - painful procedures (dentist)
 - memory = peak & ending intensity
 - add mild pain at end of extreme pain, and overall pain rated lower
- happier at work or vacation?
 - vacation (that's why I work)
 - random beeper - happier at work

Happiness

- **greatest happiness**

 over 33% say children/grandchildren

- **diary? Just over housework, below sex, socializing with friends, watching tv, praying, eating, and cooking**

Happiness

- **greatest happiness**

 over 33% say children/grandchildren

- **diary? Just over housework, below sex, socializing with friends, watching tv, praying, eating, and cooking**

- **MULTIPLE SELVES?**

Happiness

- US, moment-to-moment self-reported happiness increases until $75K, then tops out; emotional well being at the moment
- overall satisfaction goes up with income

AFFECTIVE FORECASTING

- think about your future

AFFECTIVE FORECASTING

- **think about your future**

most people think about achieving & succeeding rather than fumbling or failing

AFFECTIVE FORECASTING

- if I don't get tenure, I will be sad… if I do get tenure I will be happy

- if I win the lottery, I will be happy!

AFFECTIVE FORECASTING

- **if I don't get tenure, I will be sad… if I do get tenure I will be happy**

 two years later - no difference

- **if I win the lottery, I will be happy!**

 a year or two later, no difference

AFFECTIVE FORECASTING

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 a year or two later, no difference

- **accident leading to quadriplegia or paraplegia - return to typical ratings in 3 months**

AFFECTIVE FORECASTING

- **if I don't get tenure, I will be sad… if I do get tenure I will be happy**

 two years later - no difference

- **if I win the lottery, I will be happy!**

 a year or two later, no difference

- **accident leading to quadriplegia or paraplegia - return to typical ratings in 3 months**

hedonic adaptation

AFFECTIVE FORECASTING

- Dan Gilbert
- Harvard students in photography class - choose two favorite pictures - give one to teacher

 - irrevocable choice
 - could exchange in a few days

 who is happier?

AFFECTIVE FORECASTING

- **Dan Gilbert**
- **Harvard students in photography class - choose two favorite pictures - give one to teacher**

- irrevocable choice

- could exchange in a few days

who is happier?

irrevocable choice

PARADOX OF CHOICE
WHY MORE IS LESS

- we like choice - 285 cookies, 13 sports drinks, 75 iced teas, 200 channels
- gourmet food store - exotic, high-quality jams - taste jams - coupon for a dollar off if you buy the jam - 24 jams
 - taste 6 or taste 24 jams
 - more shoppers came to table with 24 to taste - tasted about 5 jams -

PARADOX OF CHOICE
WHY MORE IS LESS

- we like choice - 285 cookies, 13 sports drinks, 75 iced teas, 200 channels
- gourmet food store - exotic, high-quality jams - taste jams - coupon for a dollar off if you buy the jam - 24 jams
 - taste 6 or taste 24 jams
 - 6 jams/30% purchases
 - 24 jams/3% purchases

PARADOX OF CHOICE
WHY MORE IS LESS

- calling plans, health insurance, retirement plans, health-care options, etc. etc.

HAPPINESS

What people think…

- relationship/marriage
- more flexibility at work
- baby
- losing weight
- cure of a chronic disease
- more money
- more time
- beauty

HAPPINESS

- 50% genetic
- 10% circumstances
- 40% intentional activity

HAPPINESS

- **Myths**
 - **happiness is found**
 - **happiness lies in changing circumstances**
 - **you either have it or you don’t**

HAPPINESS

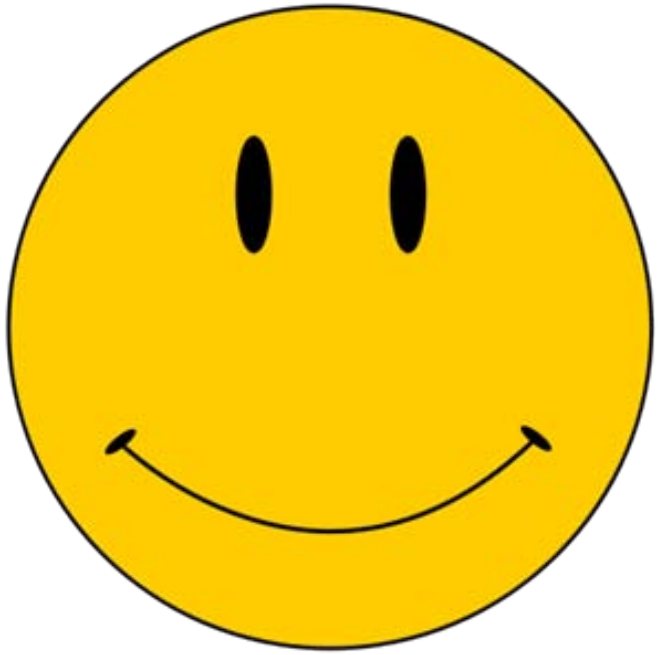
What research finds…

- **time on nurturing relations with family & friends**
- **expressing gratitude & helping others**
- **practice optimism about future**
- **savor life, in the present**
- **physical exercise**
- **commitment to lifelong goals & ambitions**
- **coping/resilience**

9.00. Intro to Psychology

***Objective*: Scientific study of human nature/mind/behavior**

- **brain**
- **perception**
- **cognition**
- **emotion**
- **personality**
- **development**
- **social interaction**
- **psychopathology**



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9.00SC Introduction to Psychology
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Questions from Lecture and the Oliver Sacks book:

1. Which is NOT true about measures of personality?
 A) their stability increases with age
 B) personality traits, according to twin studies, are about 50% heritable
 C) conscientiousness appears to diminish risk of Alzheimer's disease
 D) children are more similar to an adoptive sibling than to any randomly selected unrelated child

2. Research indicates that for a test taken in the *afternoon*
 A) introverts and extraverts perform better after consuming caffeine
 B) introverts and extraverts perform worse after consuming caffeine
 C) introverts perform better but extraverts perform worse after consuming caffeine
 D) extraverts perform better but introverts perform worse after consuming caffeine

3. In one study (from Woodward, 1998), 3-month olds and 6-month olds saw repeatedly a person reach for an object (ball) on the left and not reach for a teddy bear on the right. Then, they saw a display in which the teddy bear was on the left, and the ball on the right. The person either reached for the teddy bear on the left (same action, new object) or the ball on the right (same object, new action). Looking time was used as a measure to infer how the 3-month olds and 6-month olds interpreted the relation between the initial habituation phase and the subsequent changed test phases. The results indicated
 A) both 3-month olds and 6-month olds looked longer when the person grabbed a new object than when the person made a new action
 B) both 3-month olds and 6-month olds looked longer when the person made a new action than when the person grabbed a new object
 C) 6-month olds looked longer when the person made a new action, but 3-month olds looked longer when the person grabbed a new object
 D) 3-month olds looked longer when the person made a new action, but 6-month olds looked longer when the person grabbed a new object

4. Theory of mind research has reported which findings?
 A) maturation of theory of mind occurs earlier in interdependent than independent cultures, earlier in children with older siblings, and later in autism
 B) maturation of theory of mind occurs earlier in interdependent than independent cultures, earlier in children with younger siblings, and later in autism
 C) maturation of theory of mind occurs similarly in interdependent and independent cultures, earlier in children with older siblings, and later in autism
 D) maturation of theory of mind occurs similarly in interdependent and independent cultures, earlier in children with younger siblings, and later in autism

5. Functional neuroimaging studies have revealed that activation in the frontal lobes is more _____ in older relative to younger people and that this change in older adults is associated with _____ cognitive aging.
 A) symmetric; successful
 B) symmetric; unsuccessful
 C) asymmetric; unsuccessful
 D) asymmetric; successful

6. From age 16 to young adulthood (age 22), grey matter volume in frontal and temporal lobes _____ and white matter volume _____ .
 A) decreases; increases
 B) is constant; decreases
 C) increases; is constant
 D) increases; decreases

7. Adaptive physiological changes that occur in response to acute stress include all of the below EXCEPT
 A) suppression of immune system
 B) suppression of growth
 C) suppression of digestion
 D) suppression of cardiovascular tone

8. Which brain region (1) is activated in response to physical pain, the social pain of exclusion, and the personal pain of romantic rejection, and (2) which brain region shows a relation between volume and risk for post-traumatic stress disorder (PTSD)?
 A) (1) hippocampus; (2) cingulate cortex
 B) (1) cingulate cortex; (2) hippocampus
 C) (1) amygdala; (2) cingulate cortex
 D) (1) cingulate cortex; (2) amygdala

9. The probability that if one identical (monozygotic) twin is diagnosed with schizophrenia, so will the other twin is
 A) 90%
 B) 50%
 C) 10%
 D) 1%

10. The subgenual cingulate has been implicated as playing an important role in depression. Which one of the results below is FALSE?
 A) subgenual cingulate metabolism is reduced in depression
 B) subgenual cingulate volume is reduced in depression
 C) there is a reduced number of neurons in subgenual cingulate in depression
 D) greater activation in the subgenual cingulate predicts better drug treatment outcome

11. A survey of 5,000 young adults, ages 19-25, revealed that
 A) about 80% had a psychiatric disorder in the past year, and less than 50% with a disorder sought treatment
 B) about 10% had a psychiatric disorder in the past year, and less than 5% with a disorder sought treatment
 C) about 50% had a psychiatric disorder in the past year, and less than 25% with a disorder sought treatment
 D) about 50% had a psychiatric disorder in the past year, and about 1% with a disorder sought treatment

12. For ADHD, which is NOT true?
 A) treatment with psychostimulants does not slow development of cerebral cortex
 B) children with ADHD fail to control response inhibition relative to children without ADHD
 C) prefrontal cortical regions in children with ADHD appear to mature structurally two years or more later than in typically developing children
 D) activation for reward anticipation is greater in ADHD in the nucleus accumbens than it is in typically developing individuals

13. In Milgram's studies of obedience (shocks and learning), which factor did NOT influence the likelihood that subjects would administer shocks to the highest possible level?
 A) if experiment was at university or office building
 B) if the subject was a man or a woman
 C) if the researcher gave no commands once the experiment started
 D) if there was an ordinary person (not a scientists) in charge

14. What factor has been shown in experiments to increase the willingness for a bystander to help somebody?
 A) the presence of passive experimental confederates
 B) recent consideration of the importance of helping others
 C) being alone
 D) the personality factor of extraversion

15. In Festinger's original experiment examining cognitive dissonance, people took a boring test, and were then paid nothing (did not lie) or paid either $1 or $20 to lie and tell the next person that task had been interesting. When later asked to evaluate how truly interesting the task had been, who rated the task as most enjoyable?
 A) the people who lied and were paid $20
 B) the people who lied and were paid $1
 C) the people who did not lie
 D) the people who were paid either $1 or $20 equally

16. On average, people from a collectivist culture (e.g., Japan) differ from people from an individualistic culture (e.g., United States) in several ways. Which answer below is INCORRECT about ways in which people from collectivist cultures tend to differ from people from individualistic cultures?
 A) People from a collectivist culture are more prone to the fundamental attribution error
 B) People from a collectivist culture are less susceptible to the attractiveness bias
 C) People from a collectivist culture draw more accurately a line that is the same length relative to a line and a box (frame) previously seen
 D) People from a collectivist culture remember an object (like a fish) more accurately when it is later tested for with the original background

17. Experiments have shown people often make errors in predicting what will bring them happiness. All of the following have been shown to NOT make people happier in the long run, except which answer?
 A) having many choices
 B) a choice that can be changed over the next few days
 C) getting tenure
 D) expressing gratitude and helping others

18. People with Williams syndrome have been tested on the Implicit Association Test (IAT) and exhibited what result?
 A) exaggerated gender and racial biases
 B) no gender or racial biases
 C) a gender bias, but not a racial bias
 D) a racial bias, but not a gender bias

19. In the Oliver Sacks chapter, the patient with Tourette's syndrome was treated with Haldol and all EXCEPT which of the below occurred?
 A) he chose eventually to take the medication during the week and not during the weekend
 B) his job situation and home life improved
 C) there was an immediate positive response
 D) he became worse at ping-pong

20. In the Oliver Sacks chapter, all EXCEPT which of the below was true about the woman with "Cupid's disease"
 A) she had syphilis from her days of prostitution
 B) she became flirtatious at the age of 88
 C) penicillin killed the spirochetes evident in her spinal fluid
 D) penicillin ended her disinhibition

Questions from the Textbook Reading:

21. "A relatively consistent tendency to think, feel, or behave in a characteristic way across a range of situations" is called a:
 A) Personality dimension
 B) Superfactor
 C) Personality trait
 D) Temperament

22. In addition to personality inventories, another method to assess personality is the *projective test*. Which of the following is a defining feature of a projective test?
 A) Being asked to make sense of an ambiguous stimulus.
 B) An interview in which a a psychologist asks a series of questions about personality.
 C) A questionnaire in which participants indicate whether descriptions are true of themselves.
 D) Being asked how you would behave in novel situations.

23. Until about 3-4 months of age, babies produce a _____ reflex when their cheek is stroked lightly: They turn their head toward the stimulus and start trying to suck.
 A) moro
 B) rooting
 C) tilt
 D) babinski

24. With regard to the major milestones of language acquisition, around what age do normally functioning children know about 10,000 words?
 A) 6 years
 B) 2 years
 C) 18 months
 D) 13 years

25. Erikson's Psychosocial Stages described different issues that need to be resolved during development. Which of the following is NOT one of Erikson's Psychosocial Stages of development?
 A) Basic trust vs. mistrust
 B) Initiative vs. guilt
 C) Individualism vs. the group
 D) Generativity vs. self-absorption

26. Which of these statements is true regarding memory and aging?
 A) Acetylcholine production is impaired
 B) The hippocampus is smaller in older adults

C) Older adults have difficulty recalling specific episodic memories
D) All the above are true

27. Kohlberg identified three general levels of moral development. The _____ level focuses on the role of rules that maintain social order and allow people to get along.
A) preconventional
B) conventional
C) semiconventional
D) postconventional

28. What characteristic EEG features are found in the stage of sleep where hypnic jerk may occur and the body may be easily reawakened?
A) Less regular, lower amplitude than waking state
B) Sleep spindles and single high-amplitude waves
C) Delta waves account for 20-50% of activity
D) Delta waves account for more than 50% of activity

29. Which of the following is NOT thought to be a useful function of sleep?
A) It provides an evolutionary advantage by allowing energy conservation.
B) It helps the body restore itself from the wear and tear from the day's events.
C) It facilitates learning the material encountered during the day.
D) It facilitates an unconscious commitment to romantic partners.

30. Which of the following is NOT a useful psychological treatment for insomnia?
A) Restricting sleeping hours to the same nightly pattern.
B) Controlling bedtime stimuli so that your bed is associated only with sleep or sex, not insomnia.
C) Ingesting certain substances, such as chocolate or alcohol, before bed.
D) Regularly doing aerobic exercise about four times a week.

31. Which of the following descriptions is matched with the correct type of problem-focused coping strategy?
A) Planning – waiting to act until the appropriate time
B) Restraint coping – thinking about how to manage the stressor
C) Active coping – trying to remove or work around the stressor or to ameliorate its effects
D) Suppression of competing activities – seeking concrete advice, assistance, or information

32. Which of the following is NOT one of the seven criteria for substance dependence?
A) Despite knowledge of recurrent or ongoing physical or psychological problems caused or exacerbated by the substance, continued use of substance.
B) Important work, social, or recreational activities given up as a result of the substances
C) Persistent desire to increase or abandon control of the substance use.

D) Larger amounts of substance taken over a longer period of time than intended.

33. The DSM groups most mental disorders by their
 A) treatment.
 B) causes.
 C) theoretical basis.
 D) symptoms.

34. Which of the following best describes dysthymia?
 A) a form of depression that affects circadian rhythms and other biological functions, such as appetite.
 B) the feelings of a hopelessness and loss of energy that are a precursor to mood disorders.
 C) a mild, chronic form of depression.
 D) a severe, intermittent form of depression.

35. All of the following statements about eating disorders are true EXCEPT:
 A) People with eating disorders are preoccupied with food, body image, and weight.
 B) People with eating disorders tend to have irrational beliefs that all foods are bad.
 C) When looking at photographs of themselves, women with eating disorders spend more time looking at their "ugly" body parts.
 D) Eating disorders are associated with abnormalities in the functioning of the neurotransmitter serotonin.

36. As Mary and Bob are leaving for a trip, Mary repeatedly asks Bob if they locked the door on their way out. For their entire trip, Mary cannot stop thinking about the door and worries that someone may break into their house. Mary's thoughts about locking the door are:
 A) compulsions.
 B) obsessions.
 C) both obsessions and compulsions.
 D) neither obsessions nor compulsions.

37. Which of the following is a negative symptom of schizophrenia?
 A) hallucinations
 B) disorganized speech
 C) alogia
 D) unpredictable agitation

38. Ken's psychiatrist notes that Ken is experiencing a disruption in the usually integrated functions of consciousness, memory, and identity. Ken mostly likely has a(n) _____ disorder.
 A) adjustment
 B) schizophrenic

C) amnesic
D) dissociative

39. Which of the following is the type of therapy designed to help patients reduce problematic behaviors to develop new, more adaptive behaviors and beliefs?
 A) Client-centered therapy
 B) Dream Analysis
 C) Cognitive-Behavior Therapy
 D) Irrational Belief Centered Therapy

40. The use of medication to treat psychological disorders is known as:
 A) Tardive dyskinesia
 B) Cognitive restructuring
 C) Psychopharmacology
 D) Psychomedical Therapies.

41. Benzodiazepines are primarily used to treat:
 A) Dissociative Identity Disorder
 B) Migraines
 C) Bipolar Disorder
 D) Anxiety Disorders

42. Which of the following characteristics of attitudes is not associated with making the attitude more likely to shape behavior?
 A) The attitude is relatively stable.
 B) The attitude is important.
 C) The attitude is negative.
 D) The attitude can be easily accessed from memory.

43. The "mere exposure effect" is when:
 A) People are less likely to be persuaded when they have become too familiar with someone presenting an argument.
 B) People are more likely to be persuaded before they are familiar with someone presenting an argument.
 C) People are more likely to be persuaded when they have become familiar with someone presenting an argument.
 D) People are less likely to be persuaded when they are over-exposed to someone presenting an argument.

44. Which of the following is NOT a way to decrease prejudice?
 A) Social learning with our peers.
 B) Increased contact between groups.

C) Shifting the categories so that two groups are no longer distinct entities.
D) Increasing mutual interdependence between groups.

45. Which of the following is not consistent with the fundamental attribution bias?
A) When someone else does something wrong we believe that it is because of his or her characteristics.
B) When we do something wrong we believe it is due to our bad characteristics.
C) When someone else does something good we may believe that it was due to luck or the situation of the event.
D) When we do something good we believe it is due to our natural ability.

Short-Answer Questions

Please choose 5 of the following 13 questions, and provide your responses on the provided sheet. Only answers written on the response sheet will be graded. If you answer more than 5 questions, only the first 5 will be graded.

1. Match each of the "Big Five Superfactor" in the left column to the one personality inventory question in the right column that bears on the superfactor.

Big Five Superfactor	Personality Inventory Question "I am a person who..."
1) Extraversion	A) ...tends to be disorganized.
2) Agreeableness	B) ...is sometimes shy.
3) Conscientiousness	C) ...prefers work that is routine.
4) Openness	D) ...has a forgiving nature.

2. What are Piaget's Periods of Cognitive Development?

3. Children become attached to their primary caregivers but may end up being attached in different ways. What are the four types of attachment?

4. Selye's three-stage stress response is called the _____(1)_____ syndrome. The first stage is _____(2)_____, when the body mobilizes its resources to fight or flee. The second stage is _____(3)_____, when the body mobilizes its resources to achieve homeostasis in the presence of the stressor. In Stage 3, _____(4)_____, continued efforts to achieve homeostasis wear the body out and may be very damaging.

5. List the four subtypes of schizophrenia specified by the DSM.

6. Emotional or dramatic behaviors are common symptoms of Cluster _____(1)_____ personality disorders. Jane, Max, and Penny each have a personality disorder in this Cluster.

 Jane's need to always be the center of attention and excessive expression of emotion make it difficult for her to get along with her friends and co-workers . Jane has _____(2)_____ personality disorder.

 Max has been arrested multiple times, has difficulty controlling his impulses, and exhibits a long-standing pattern of reckless disregard for others. Max has _____(3)_____ personality disorder.

 Penny displays an exaggerated sense of self-importance, lack of empathy, and constantly asks others to admire her new diamond ring. Penny has _____(4)_____ personality disorder.

7. Experiments have shown that there are psychological modifiers that can significantly reduce stress responses to difficult circumstances. Name 4 such modifiers

8. People who rate themselves the very most happy often report satisfaction from what sort of two activities (1 & 2)? People who report themselves as a step less happy (but still quite happy) often report satisfaction from what other two activities (3 & 4)?

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9.00SC Introduction to Psychology
Fall 2011

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Questions from Lecture and the Oliver Sacks book:

1. Which is NOT true about measures of personality?
 A) their stability increases with age
 B) personality traits, according to twin studies, are about 50% heritable
 C) conscientiousness appears to diminish risk of Alzheimer's disease
 D) children are more similar to an adoptive sibling than to any randomly selected unrelated child

2. Research indicates that for a test taken in the *afternoon*
 A) introverts and extraverts perform better after consuming caffeine
 B) introverts and extraverts perform worse after consuming caffeine
 C) introverts perform better but extraverts perform worse after consuming caffeine
 D) extraverts perform better but introverts perform worse after consuming caffeine

3. In one study (from Woodward, 1998), 3-month olds and 6-month olds saw repeatedly a person reach for an object (ball) on the left and not reach for a teddy bear on the right. Then, they saw a display in which the teddy bear was on the left, and the ball on the right. The person either reached for the teddy bear on the left (same action, new object) or the ball on the right (same object, new action). Looking time was used as a measure to infer how the 3-month olds and 6-month olds interpreted the relation between the initial habituation phase and the subsequent changed test phases. The results indicated
 A) both 3-month olds and 6-month olds looked longer when the person grabbed a new object than when the person made a new action
 B) both 3-month olds and 6-month olds looked longer when the person made a new action than when the person grabbed a new object
 C) 6-month olds looked longer when the person made a new action, but 3-month olds looked longer when the person grabbed a new object
 D) 3-month olds looked longer when the person made a new action, but 6-month olds looked longer when the person grabbed a new object

4. Theory of mind research has reported which findings?
 A) maturation of theory of mind occurs earlier in interdependent than independent cultures, earlier in children with older siblings, and later in autism
 B) maturation of theory of mind occurs earlier in interdependent than independent cultures, earlier in children with younger siblings, and later in autism
 C) maturation of theory of mind occurs similarly in interdependent and independent cultures, earlier in children with older siblings, and later in autism
 D) maturation of theory of mind occurs similarly in interdependent and independent cultures, earlier in children with younger siblings, and later in autism

5. Functional neuroimaging studies have revealed that activation in the frontal lobes is more _____ in older relative to younger people and that this change in older adults is associated with _____ cognitive aging.
 A) symmetric; successful
 B) symmetric; unsuccessful
 C) asymmetric; unsuccessful
 D) asymmetric; successful

6. From age 16 to young adulthood (age 22), grey matter volume in frontal and temporal lobes _____ and white matter volume _____ .
 A) decreases; increases
 B) is constant; decreases
 C) increases; is constant
 D) increases; decreases

7. Adaptive physiological changes that occur in response to acute stress include all of the below EXCEPT
 A) suppression of immune system
 B) suppression of growth
 C) suppression of digestion
 D) suppression of cardiovascular tone

8. Which brain region (1) is activated in response to physical pain, the social pain of exclusion, and the personal pain of romantic rejection, and (2) which brain region shows a relation between volume and risk for post-traumatic stress disorder (PTSD)?
 A) (1) hippocampus; (2) cingulate cortex
 B) (1) cingulate cortex; (2) hippocampus
 C) (1) amygdala; (2) cingulate cortex
 D) (1) cingulate cortex; (2) amygdala

9. The probability that if one identical (monozygotic) twin is diagnosed with schizophrenia, so will the other twin is
 A) 90%
 B) 50%
 C) 10%
 D) 1%

10. The subgenual cingulate has been implicated as playing an important role in depression. Which one of the results below is FALSE?
 A) subgenual cingulate metabolism is reduced in depression
 B) subgenual cingulate volume is reduced in depression
 C) there is a reduced number of neurons in subgenual cingulate in depression
 D) greater activation in the subgenual cingulate predicts better drug treatment outcome

11. A survey of 5,000 young adults, ages 19-25, revealed that
 A) about 80% had a psychiatric disorder in the past year, and less than 50% with a disorder sought treatment
 B) about 10% had a psychiatric disorder in the past year, and less than 5% with a disorder sought treatment
 C) about 50% had a psychiatric disorder in the past year, and less than 25% with a disorder sought treatment
 D) about 50% had a psychiatric disorder in the past year, and about 1% with a disorder sought treatment

12. For ADHD, which is NOT true?
 A) treatment with psychostimulants does not slow development of cerebral cortex
 B) children with ADHD fail to control response inhibition relative to children without ADHD
 C) prefrontal cortical regions in children with ADHD appear to mature structurally two years or more later than in typically developing children
 D) activation for reward anticipation is greater in ADHD in the nucleus accumbens than it is in typically developing individuals

13. In Milgram's studies of obedience (shocks and learning), which factor did NOT influence the likelihood that subjects would administer shocks to the highest possible level?
 A) if experiment was at university or office building
 B) if the subject was a man or a woman
 C) if the researcher gave no commands once the experiment started
 D) if there was an ordinary person (not a scientists) in charge

14. What factor has been shown in experiments to increase the willingness for a bystander to help somebody?
 A) the presence of passive experimental confederates
 B) recent consideration of the importance of helping others
 C) being alone
 D) the personality factor of extraversion

15. In Festinger's original experiment examining cognitive dissonance, people took a boring test, and were then paid nothing (did not lie) or paid either $1 or $20 to lie and tell the next person that task had been interesting. When later asked to evaluate how truly interesting the task had been, who rated the task as most enjoyable?
 A) the people who lied and were paid $20
 B) the people who lied and were paid $1
 C) the people who did not lie
 D) the people who were paid either $1 or $20 equally

16. On average, people from a collectivist culture (e.g., Japan) differ from people from an individualistic culture (e.g., United States) in several ways. Which answer below is INCORRECT about ways in which people from collectivist cultures tend to differ from people from individualistic cultures?
 A) People from a collectivist culture are more prone to the fundamental attribution error
 B) People from a collectivist culture are less susceptible to the attractiveness bias
 C) People from a collectivist culture draw more accurately a line that is the same length relative to a line and a box (frame) previously seen
 D) People from a collectivist culture remember an object (like a fish) more accurately when it is later tested for with the original background

17. Experiments have shown people often make errors in predicting what will bring them happiness. All of the following have been shown to NOT make people happier in the long run, except which answer?
 A) having many choices
 B) a choice that can be changed over the next few days
 C) getting tenure
 D) expressing gratitude and helping others

18. People with Williams syndrome have been tested on the Implicit Association Test (IAT) and exhibited what result?
 A) exaggerated gender and racial biases
 B) no gender or racial biases
 C) a gender bias, but not a racial bias
 D) a racial bias, but not a gender bias

19. In the Oliver Sacks chapter, the patient with Tourette's syndrome was treated with Haldol and all EXCEPT which of the below occurred?
 A) he chose eventually to take the medication during the week and not during the weekend
 B) his job situation and home life improved
 C) there was an immediate positive response
 D) he became worse at ping-pong

20. In the Oliver Sacks chapter, all EXCEPT which of the below was true about the woman with "Cupid's disease"
 A) she had syphilis from her days of prostitution
 B) she became flirtatious at the age of 88
 C) penicillin killed the spirochetes evident in her spinal fluid
 D) penicillin ended her disinhibition

Questions from the Textbook Reading:

21. "A relatively consistent tendency to think, feel, or behave in a characteristic way across a range of situations" is called a:
 A) Personality dimension
 B) Superfactor
 C) Personality trait
 D) Temperament

22. In addition to personality inventories, another method to assess personality is the *projective test*. Which of the following is a defining feature of a projective test?
 A) Being asked to make sense of an ambiguous stimulus.
 B) An interview in which a a psychologist asks a series of questions about personality.
 C) A questionnaire in which participants indicate whether descriptions are true of themselves.
 D) Being asked how you would behave in novel situations.

23. Until about 3-4 months of age, babies produce a _____ reflex when their cheek is stroked lightly: They turn their head toward the stimulus and start trying to suck.
 A) moro
 B) rooting
 C) tilt
 D) babinski

24. With regard to the major milestones of language acquisition, around what age do normally functioning children know about 10,000 words?
 A) 6 years
 B) 2 years
 C) 18 months
 D) 13 years

25. Erikson's Psychosocial Stages described different issues that need to be resolved during development. Which of the following is NOT one of Erikson's Psychosocial Stages of development?
 A) Basic trust vs. mistrust
 B) Initiative vs. guilt
 C) Individualism vs. the group
 D) Generativity vs. self-absorption

26. Which of these statements is true regarding memory and aging?
 A) Acetylcholine production is impaired
 B) The hippocampus is smaller in older adults

C) Older adults have difficulty recalling specific episodic memories
D) All the above are true

27. Kohlberg identified three general levels of moral development. The _____ level focuses on the role of rules that maintain social order and allow people to get along.
A) preconventional
B) conventional
C) semiconventional
D) postconventional

28. What characteristic EEG features are found in the stage of sleep where hypnic jerk may occur and the body may be easily reawakened?
A) Less regular, lower amplitude than waking state
B) Sleep spindles and single high-amplitude waves
C) Delta waves account for 20-50% of activity
D) Delta waves account for more than 50% of activity

29. Which of the following is NOT thought to be a useful function of sleep?
A) It provides an evolutionary advantage by allowing energy conservation.
B) It helps the body restore itself from the wear and tear from the day's events.
C) It facilitates learning the material encountered during the day.
D) It facilitates an unconscious commitment to romantic partners.

30. Which of the following is NOT a useful psychological treatment for insomnia?
A) Restricting sleeping hours to the same nightly pattern.
B) Controlling bedtime stimuli so that your bed is associated only with sleep or sex, not insomnia.
C) Ingesting certain substances, such as chocolate or alcohol, before bed.
D) Regularly doing aerobic exercise about four times a week.

31. Which of the following descriptions is matched with the correct type of problem-focused coping strategy?
A) Planning – waiting to act until the appropriate time
B) Restraint coping – thinking about how to manage the stressor
C) Active coping – trying to remove or work around the stressor or to ameliorate its effects
D) Suppression of competing activities – seeking concrete advice, assistance, or information

32. Which of the following is NOT one of the seven criteria for substance dependence?
A) Despite knowledge of recurrent or ongoing physical or psychological problems caused or exacerbated by the substance, continued use of substance.
B) Important work, social, or recreational activities given up as a result of the substances
C) Persistent desire to increase or abandon control of the substance use.

D) Larger amounts of substance taken over a longer period of time than intended.

33. The DSM groups most mental disorders by their
A) treatment.
B) causes.
C) theoretical basis.
D) symptoms.

34. Which of the following best describes dysthymia?
A) a form of depression that affects circadian rhythms and other biological functions, such as appetite.
B) the feelings of a hopelessness and loss of energy that are a precursor to mood disorders.
C) a mild, chronic form of depression.
D) a severe, intermittent form of depression.

35. All of the following statements about eating disorders are true EXCEPT:
A) People with eating disorders are preoccupied with food, body image, and weight.
B) People with eating disorders tend to have irrational beliefs that all foods are bad.
C) When looking at photographs of themselves, women with eating disorders spend more time looking at their "ugly" body parts.
D) Eating disorders are associated with abnormalities in the functioning of the neurotransmitter serotonin.

36. As Mary and Bob are leaving for a trip, Mary repeatedly asks Bob if they locked the door on their way out. For their entire trip, Mary cannot stop thinking about the door and worries that someone may break into their house. Mary's thoughts about locking the door are:
A) compulsions.
B) obsessions.
C) both obsessions and compulsions.
D) neither obsessions nor compulsions.

37. Which of the following is a negative symptom of schizophrenia?
A) hallucinations
B) disorganized speech
C) alogia
D) unpredictable agitation

38. Ken's psychiatrist notes that Ken is experiencing a disruption in the usually integrated functions of consciousness, memory, and identity. Ken mostly likely has a(n) _____ disorder.
A) adjustment
B) schizophrenic

C) amnesic
D) dissociative

39. Which of the following is the type of therapy designed to help patients reduce problematic behaviors to develop new, more adaptive behaviors and beliefs?
A) Client-centered therapy
B) Dream Analysis
C) Cognitive-Behavior Therapy
D) Irrational Belief Centered Therapy

40. The use of medication to treat psychological disorders is known as:
A) Tardive dyskinesia
B) Cognitive restructuring
C) Psychopharmacology
D) Psychomedical Therapies.

41. Benzodiazepines are primarily used to treat:
A) Dissociative Identity Disorder
B) Migraines
C) Bipolar Disorder
D) Anxiety Disorders

42. Which of the following characteristics of attitudes is not associated with making the attitude more likely to shape behavior?
A) The attitude is relatively stable.
B) The attitude is important.
C) The attitude is negative.
D) The attitude can be easily accessed from memory.

43. The "mere exposure effect" is when:
A) People are less likely to be persuaded when they have become too familiar with someone presenting an argument.
B) People are more likely to be persuaded before they are familiar with someone presenting an argument.
C) People are more likely to be persuaded when they have become familiar with someone presenting an argument.
D) People are less likely to be persuaded when they are over-exposed to someone presenting an argument.

44. Which of the following is NOT a way to decrease prejudice?
A) Social learning with our peers.
B) Increased contact between groups.

C) Shifting the categories so that two groups are no longer distinct entities.
D) Increasing mutual interdependence between groups.

45. Which of the following is not consistent with the fundamental attribution bias?
A) When someone else does something wrong we believe that it is because of his or her characteristics.
B) When we do something wrong we believe it is due to our bad characteristics.
C) When someone else does something good we may believe that it was due to luck or the situation of the event.
D) When we do something good we believe it is due to our natural ability.

Short-Answer Questions

Please choose 5 of the following 13 questions, and provide your responses on the provided sheet. Only answers written on the response sheet will be graded. If you answer more than 5 questions, only the first 5 will be graded.

1. Match each of the "Big Five Superfactor" in the left column to the one personality inventory question in the right column that bears on the superfactor.

Big Five Superfactor	Personality Inventory Question "I am a person who..."
1) Extraversion	A) ...tends to be disorganized.
2) Agreeableness	B) ...is sometimes shy.
3) Conscientiousness	C) ...prefers work that is routine.
4) Openness	D) ...has a forgiving nature.

Answers:
1-B 2-D 3-A 4-C (p291)

2. What are Piaget's Periods of Cognitive Development?

Sensorimotor; Preoperational; Concrete operations; Formal operations; p.334

3. Children become attached to their primary caregivers but may end up being attached in different ways. What are the four types of attachment?

1) Secure; 2) Avoidant; 3) Resistant; 4) Disorganized/disoriented; p.339

4. Selye's three-stage stress response is called the _____(1)_____ syndrome. The first stage is _____(2)_____, when the body mobilizes its resources to fight or flee. The second stage is _____(3)_____, when the body mobilizes its resources to achieve homeostasis in the presence of the stressor. In Stage 3, _____(4)_____, continued efforts to achieve homeostasis wear the body out and may be very damaging.

Answers: (1) general adaptation syndrome; (2) alarm; (3) resistance; (4) exhaustion

5. List the four subtypes of schizophrenia specified by the DSM.

Answers: (1) paranoid; (2) disorganized; (3) catatonic; (4) undifferentiated (Chapter 11, p. 424)

6. Emotional or dramatic behaviors are common symptoms of Cluster _____(1)_____ personality disorders. Jane, Max, and Penny each have a personality disorder in this Cluster.

 Jane's need to always be the center of attention and excessive expression of emotion make it difficult for her to get along with her friends and co-workers . Jane has _____(2)_____ personality disorder.

 Max has been arrested multiple times, has difficulty controlling his impulses, and exhibits a long-standing pattern of reckless disregard for others. Max has _____(3)_____ personality disorder.

 Penny displays an exaggerated sense of self-importance, lack of empathy, and constantly asks others to admire her new diamond ring. Penny has _____(4)_____ personality disorder.

Answers: (1) B; (2) histrionic; (3) antisocial; (4) narcissistic
(Chapter 11, p. 433-434)

7. Experiments have shown that there are psychological modifiers that can significantly reduce stress responses to difficult circumstances. Name 4 such modifiers

outlet for frustration; sense of predictability; sense of control; perception of life improving; social support

8. People who rate themselves the very most happy often report satisfaction from what sort of two activities (1 & 2)? People who report themselves as a step less happy (but still quite happy) often report satisfaction from what other two activities (3 & 4)?

Super happy - Close relations volunteer work
Happy – education, politics, income

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